AUTOMOTIVE INDUSTRIES

A CHILTON PUBLICATION

MAY 1, 1959

Features • • •

Machining Aluminum Transmission Cases at Ford

Latest Automotive Heat Treating Equipment, Part III

New Cars at the International Automobile Show

Details of Engines for IHC's B-Line of Trucks

A New Welding Method, the Dip Transfer Process

Design and Construction of the Ford Gas Turbine

COMPLETE TABLE OF CONTENTS, PAGE 3

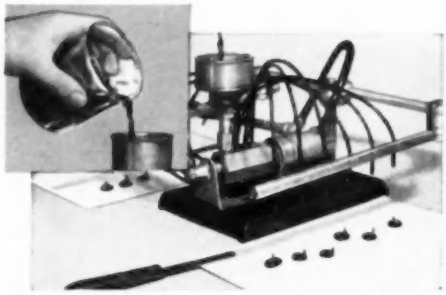
Automotive and Aviation Manufacturing

ENGINEERING • PRODUCTION • MANAGEMENT

Bertsch & Co. finds solution to lubrication problem...with Standard Oil's

RYKON Grease R

Centralized lube system pumps grease through 80 ft. lines in cold temperature; no clogging



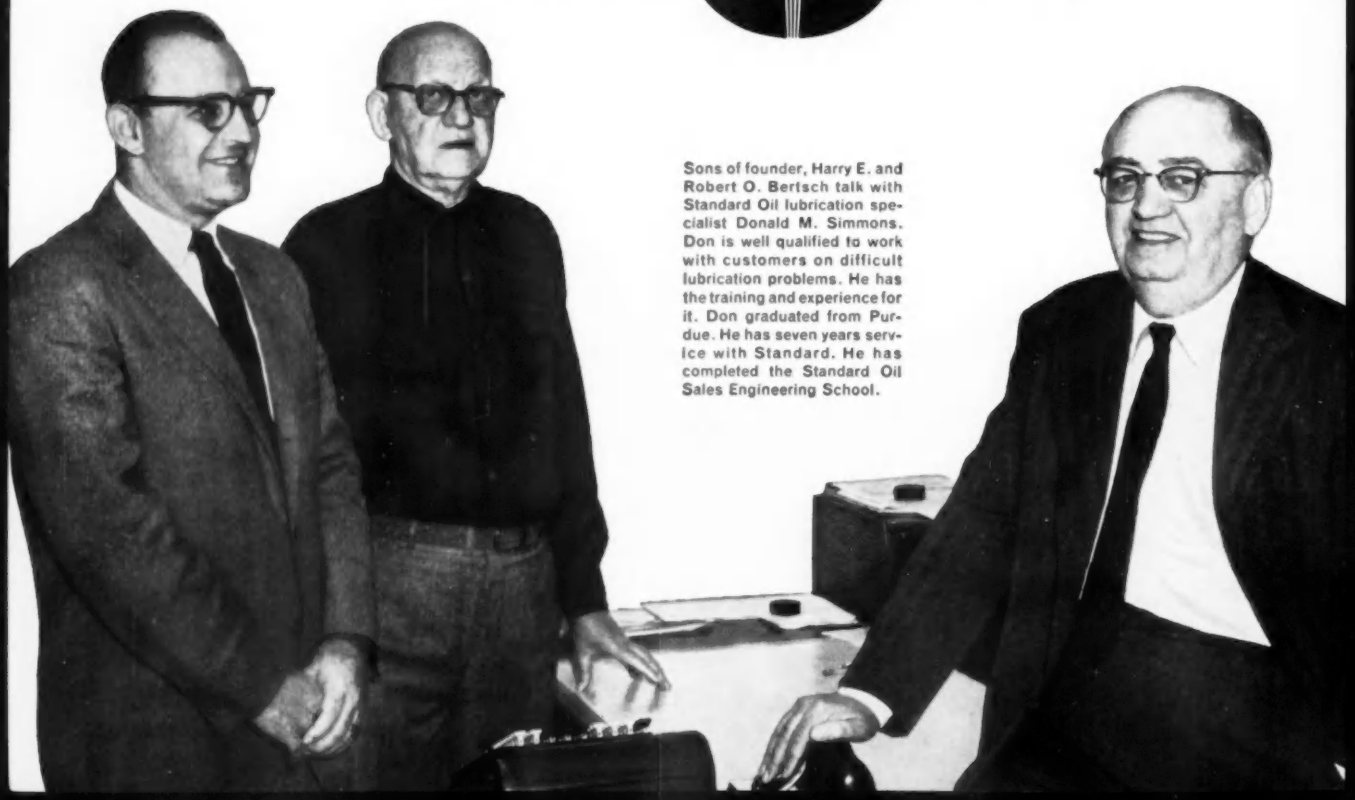
Lab demonstration shows how RYKON Grease R works. Grease is poured into reservoir as a fluid. The shearing action exerted by pump and outlets irreversably converts fluid to a grease. Grease is ejected from outlet lines.

Problem: Bertsch & Company, Cambridge City, Indiana, makes pinch rolls and other metal bending equipment. A centralized lubrication system used on one pinch roll model had to pump grease 80 feet. Greases tried could not be pumped this distance without clogging lines. Since machines are shipped all over the world and are often in operation in cold climates, Bertsch had additional problems. The grease had to be pumpable in cold temperatures. It had to be foolproof so that customers beyond the reach of service calls would experience no problems.

What was done: Bertsch turned to Standard Oil for help. Standard Oil man, D. M. Simmons had the answer: Rykon Grease R. This is a rheopectic grease, one that flows like an oil. Its rheopectic properties cause it, under slight shearing stresses, to turn to a thick, durable grease. Rykon Grease R flows to the pump as a fluid, lubricates the bearings as a grease.

What you can do: Maybe you manufacture equipment that needs a centralized lubrication system and you have been looking for a grease like Rykon R. Get the facts about Rykon Grease R from your nearby Standard Oil lubrication specialist anywhere in the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.**

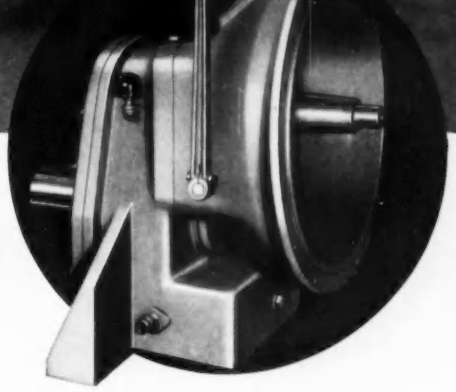
You expect more from **STANDARD** *and you get it!*



Sons of founder, Harry E. and Robert O. Bertsch talk with Standard Oil lubrication specialist Donald M. Simmons. Don is well qualified to work with customers on difficult lubrication problems. He has the training and experience for it. Don graduated from Purdue. He has seven years service with Standard. He has completed the Standard Oil Sales Engineering School.

On big equipment... to balance high engine speeds—

Snow Master manufactured by Sicard Industries, Inc. Watertown, New York



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save maintenance costs!

Reducing high auxiliary engine speeds to those best suited for snow plows is a typical Cotta job. Why? First . . . because Cotta heavy-duty Reduction Units are low in cost, ordered in large or small quantity lots. Second . . . maintenance is low, too, because they're built to withstand heavy, intermittent shock loads . . . give dependable performance on grueling, 'round-the-clock work schedules — indoors or out. And third . . . because Cotta Reduction Units are precision-engineered and skillfully assembled by *specialists* with long experience and *know-how* in heavy-duty power transmission work.

If you build cranes, locomotives, drillers, shovels, generators, pumps or other heavy-duty equipment, and you want a standard or "engineered-to-order" Reduction Unit — input torque ranging from 150 to 2000 foot pounds — see Cotta *first!*

THIS INFORMATION WILL HELP YOU

Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

An Assurance of Dependable Service

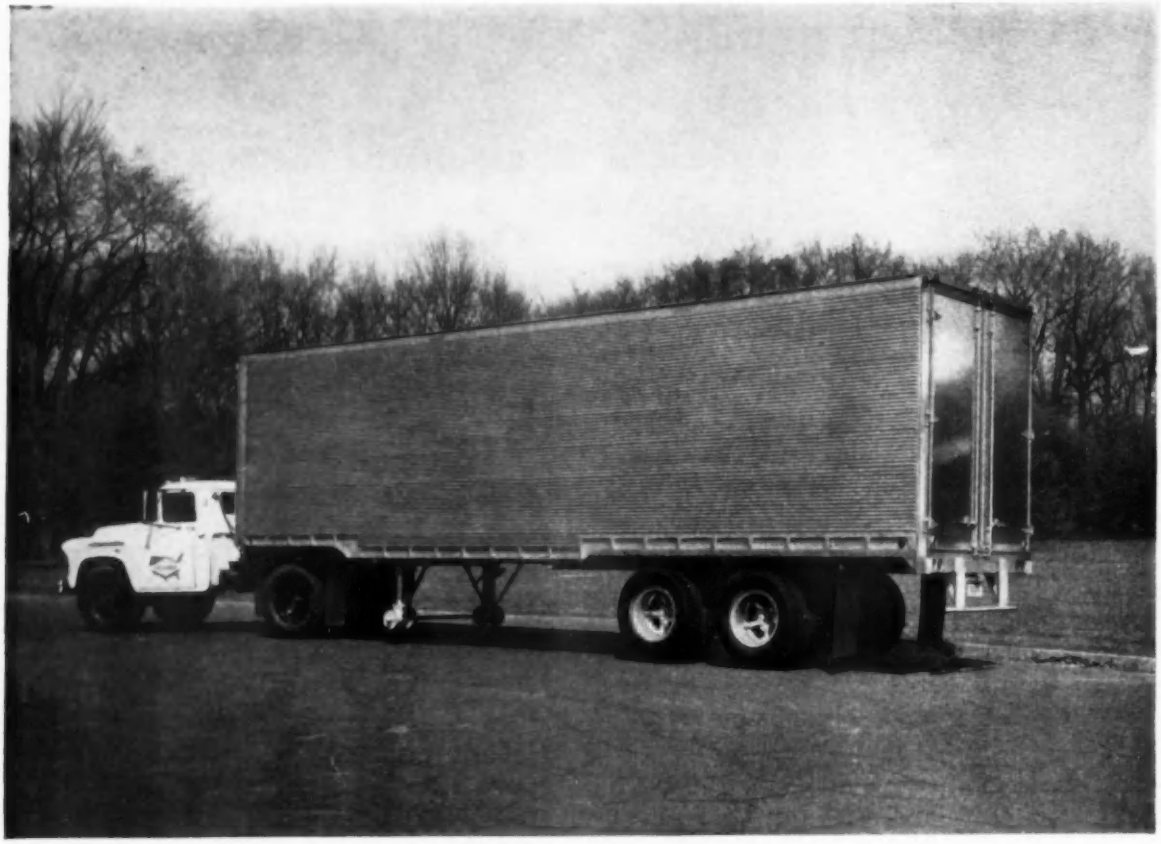
COTTA

HEAVY-DUTY REDUCTION UNITS

"Engineered-to-order"

← Circle 101 on Inquiry Card, for more data

Circle 104 on Inquiry Card, for more Data



Trailer constructed of corrugated, strong, nickel-containing stainless steel on top and sides, polished stainless front and rear, has modern good looks. Gives extra years of low-upkeep service. Made by Fruehauf Trailer Company.

Put more sell into trailers with stainless steel

See what you can do with nickel-containing stainless steel to boost cargo space ... service life ... appearance

Look into the dollars-and-cents advantages you can put into trailers with nickel-containing stainless steels:

High strength permits use of lightweight, thin-gauge sections for:

(1) more payload – trailer is stronger, not heavier.

(2) more inside space – wall bracing is compact.

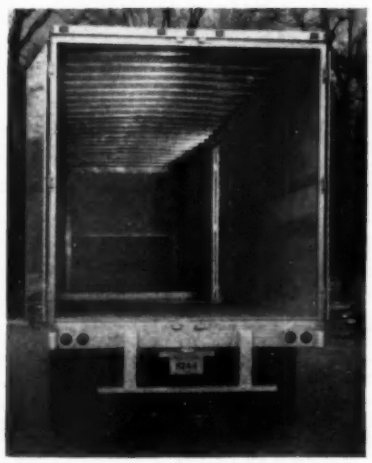
Corrosion resistance gives:

(1) long service life – resists storm, spillage.

(2) low upkeep – no painting needed; cleans easily.

There are other advantages—tough, hard, nickel-containing stainless steel provides exceptional durability – it's harder to scratch or damage. The corrugations give the unit additional longitudinal strength, rigidity.

You'll likely find several more ways to use low-upkeep, durable, nickel-containing stainless steels. For latest information on these versatile metals, write Inco:



Rear view, showing corrugated stainless steel roof and bows.

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street New York 5, N. Y.

INCO NICKEL

NICKEL MAKES STAINLESS PERFORM BETTER LONGER

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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE · PUBLISHED SEMI-MONTHLY

MAY 1, 1959 VOL. 120 No. 9

Features • • •

Machining Aluminum Transmission Cases

Ford's automatic transmission plant at Sharonville, O., boasts the latest types of machine tool and transfer equipment. This article, first in a series, covers machining of the transmission case for four different models of Ford's automatic transmission. Page 30.

Ford Gas Turbine Engine

Ford Motor Co.'s new 300-hp gas turbine engine is said to attain maximum fuel economy in a range of 25 to 100 per cent of power. Page 35.

Compact Cars Take Spotlight

Compact cars with American styling touches captured the spotlight at the recent Third International Automobile Show. Also seen at the show were a wide range of small cars aimed at both the American and world markets. Page 36.

New Welding Process

Air Reduction Sales Co. engineers have devised a new method of welding mild steel and low alloy steel in an atmosphere of inert gas. Metal is transferred by a wiping action at the time of short circuit instead of by projecting it through an arc stream. Page 39.

Latest Developments in Heat Treating

Automotive plants buy about 23 per cent of the induction heating equipment sold each year in the U. S. Typical installations used for heat treating, hardening, brazing, soldering, forging, forming, upsetting, shrink fitting, and melting are detailed here. Third of a three-part series. Page 40.

International Harvester's New Engine

A major feature of International Harvester's V-8 engine for its new B-line of trucks is the configuration of the combustion chamber. The unique design is said to get rid of the "ping" that occurs when regular gasoline is used in high-compression engines. Page 46.

Computer Runs Refinery

Computer manufacturers as well as oil and chemical producers are eyeing with interest a new "breakthrough" at Texaco's Port Arthur refinery, hailed as the first big step to full automation. Page 56.

42 New Product Items, And Other Features, Such As:

Farm report, news of machinery industries, metals, automation news report, and industry statistics.

. . . continued on next page

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People Love It

FROM NEW YORK: "All four of my brakes are always perfectly adjusted whether I'm on the throughway or driving in bumper-to-bumper traffic in the city."

FROM DENVER: "There's new pleasure in mountain driving now that I know my brakes always have maximum stopping power."

FROM ATLANTA: "Knowing our brakes are never out of adjustment gives me a wonderful safe feeling. I'm at ease even when taking the children to school."

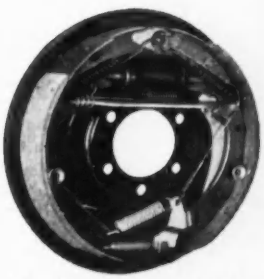
FROM MINNEAPOLIS: "In all kinds of weather, self-adjusting brakes give me stopping power at its best—and save the cost of brake adjustments."

AGAIN . . . BRAKES ARE NEWS IN DEALERS' SHOWROOMS!

Bendix* Self-Adjusting Brakes give dealers a double-barreled sales appeal: safety plus economy. And those in close touch with today's market know that these two appeals —safety and economy—are among the most powerful sales points that can be made to the American buying public.

Car prospects quickly realize that there's real safety in always maintaining the brakes at maximum stopping power. And the obvious savings that they make by eliminating the expense and bother of periodic brake adjustments. What's more, with all brake shoes always correctly adjusted, there's always the right clearance between pedal and floor. And that's a feeling any car buyer appreciates.

Reasons like these make self-adjusting brakes a good "talking piece" for dealers. It won't be long before car buyers everywhere will know about self-adjusting brakes —and want them. But this latest advancement in brakes joins power brakes and power steering as examples of how Bendix pioneers and develops improvements to meet the needs of the automobile industry.



When shoe clearance exceeds a predetermined amount, a ratchet sets up the star wheel adjuster one notch—as the brakes are applied when the car is in reverse. This automatically adjusts the shoes to exactly the right fit within the drum and compensates for lining wear.

*REG. U. S. PAT. OFF.

Bendix PRODUCTS DIVISION South Bend, IND.

Bendix AVIATION CORPORATION

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Your ELECTRIC sales engineer is an able helper when it comes to putting your ideas on wheels. He can help you with a new design, make cost-cutting suggestions for a redesign, give you prices while you're planning.

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Call or write today for the exact disc or spoke-type wheel (steel or rubber tired), rim, hub, axle or component part you're looking for.

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DIVISION OF THE FIRESTONE TIRE & RUBBER COMPANY

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CALENDAR

OF COMING SHOWS AND MEETINGS

ASME Maintenance and Plant Engineering, national conference, Edgewater Beach Hotel, Chicago, Ill. .....May 4-5

ASM Southern Metals Conference, Augusta, Ga. .....May 4-6

Fifth National Instrumentation Flight Test Symposium, sponsored by Instrument Society of America, Seattle, Wash. ....May 4-7

National Industrial Production Show, Toronto, Canada .....May 4-8

Interdisciplinary Conference on Self Organizing Systems, sponsored by Information Systems Branch (Office of Naval Research) and Armour Research Foundation, Museum of Science and Industry, Chicago, Ill. .....May 5-6

Industrial Waste Conference, Purdue Univ., Lafayette, Ind....May 5-7

Institute of Radio Engineers, 7th regional conference and trade show, University of New Mexico, Albuquerque, New Mex.....May 6-8

World Car Show '59, Roosevelt Raceway, Westbury, L. I., N. Y. May 8

Copper & Brass Research Association, annual meeting, The Homestead, Hot Springs, Va. May 10-13

Second Annual Joint Conference on Automatic Techniques, sponsored by ASME, AIEE, and IRE, Pike Congress Hotel, Chicago, Ill. .....May 11-13

ASME National Production Engineering Conference, Statler-Hilton Hotel, Detroit, Mich. ..May 12-14

Instrument Society of America, fifth annual symposium on instrumental methods of analysis, Shamrock-Hilton Hotel, Houston, Tex. .....May 18-20

Society for Experimental Stress Analysis, spring meeting and exhibition, Sheraton Park Hotel, Washington, D. C. .....May 20-22

Commercial Chemical Development Association, Spring Resort Meeting, Pocono Manor, Mt. Pocono, Pa. .....May 25-26

American Society for Quality Control, annual convention and exposition, Hotel Sheraton, Cleveland, O. .....May 25-27

ASME Design Engineering Show and Conference, Convention Hall, Philadelphia, Pa. ....May 25-28

10th Annual Industrial Research Conference, sponsored by Columbia University, Dept. of Industrial and Management Engineering, Arden House, Harriman, N. Y. .....May 31-June 5

Material Handling Institute Exposition, Public Auditorium, Cleveland, O. .....June 9-12

Pressed Metal Institute, national sales seminar for metal stamping industry, Bedford Springs Hotel, Bedford, Pa. .....June 11-12

Manufacturing Chemists' Association, 87th annual meeting, The Greenbrier, White Sulphur Springs, W. Va. .....June 11-13

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BIG SWITCH FEATURES IN SMALL SWITCH SIZE

- heavy duty nylon latch mechanism
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DENISON LOXSWITCH

MODEL M LIMIT SWITCH

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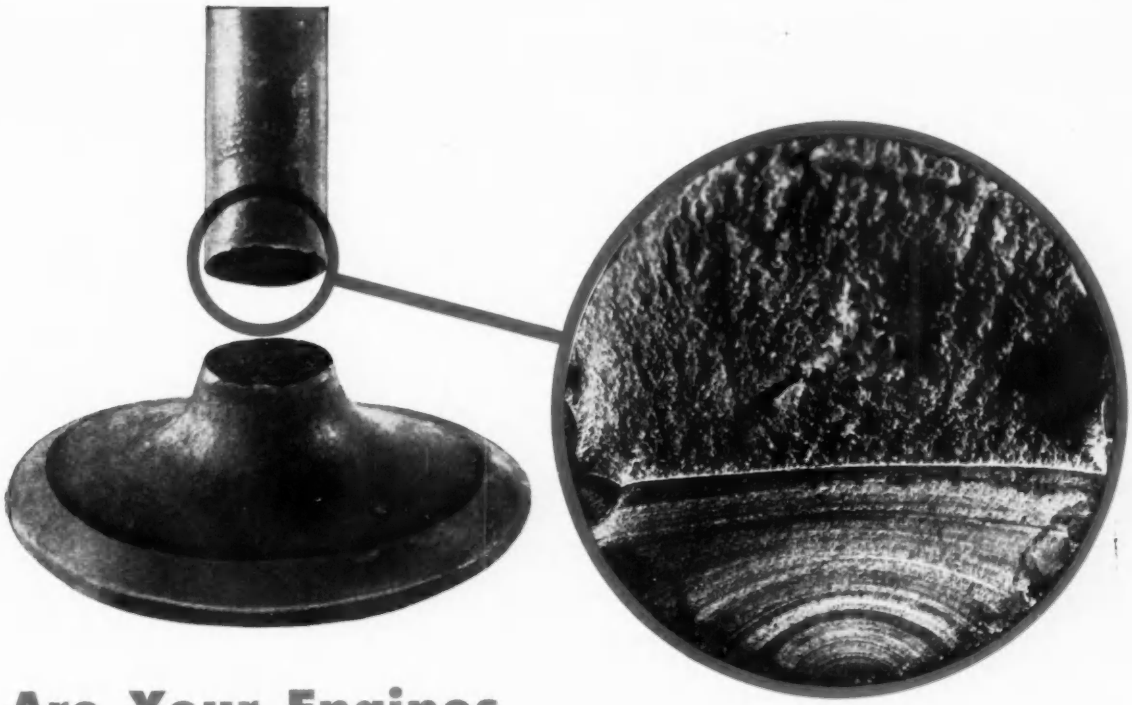

Are Your Engines Plagued by Failures Like This?

Eaton Engineers Can Help You Solve This Problem

The photographs above illustrate a typical fatigue-type failure caused by overstressing, in which fracture starts at the surface and, with repeated high stress, progresses to final break.

If you are an engine manufacturer and are having valve gear problems, Eaton engineers will be glad to consult with you and recommend procedures to help solve them. Or if you are designing new engines, perhaps our past valve experience can be valuable to you. Write, wire, or phone — there's no obligation.

Eaton Technical Reports are Available to Manufacturers

Eaton valve engineers will be glad to make a thorough study for you and furnish a complete technical report.

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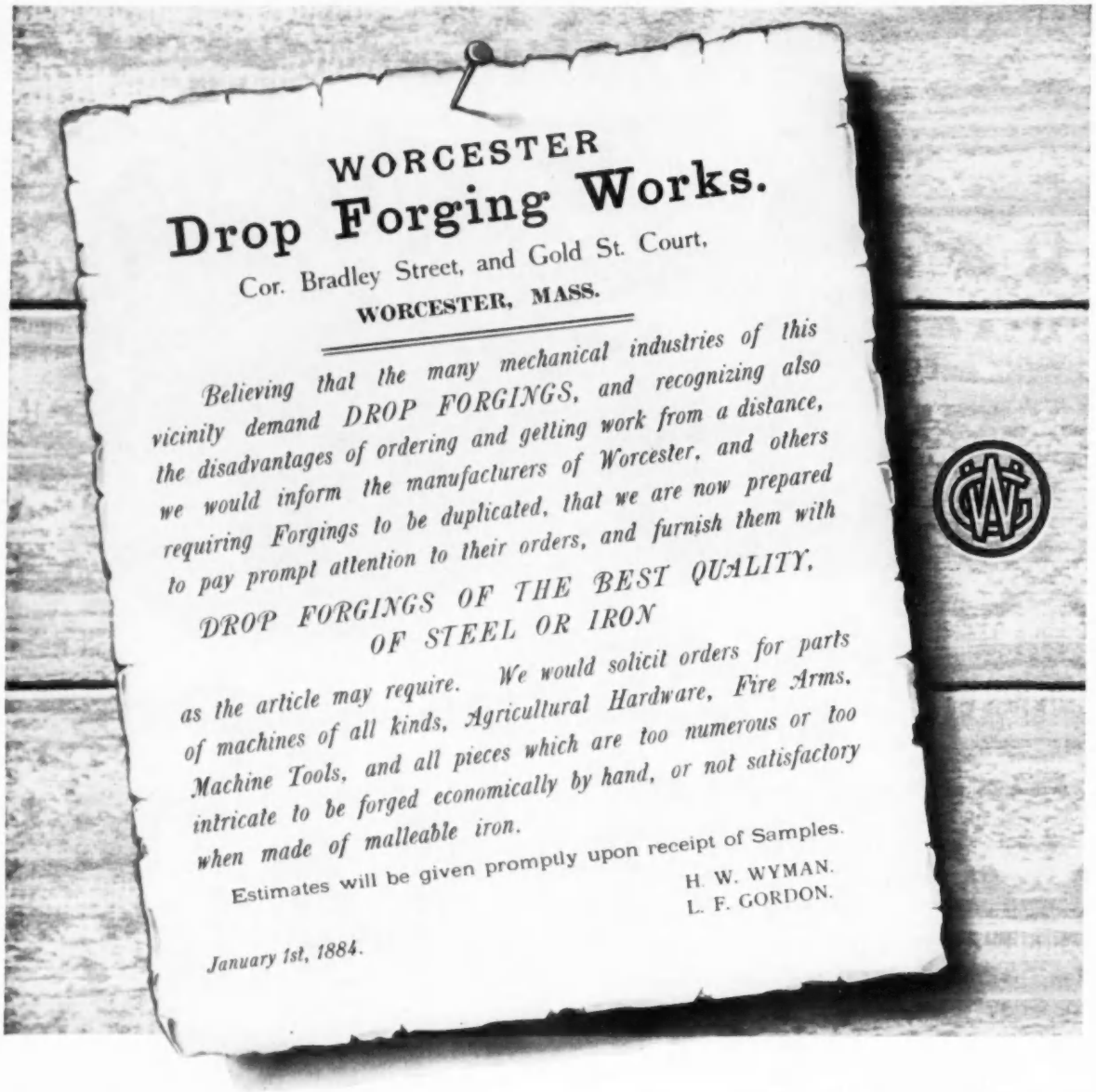

WORCESTER

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WORCESTER, MASS.

Believing that the many mechanical industries of this vicinity demand DROP FORGINGS, and recognizing also the disadvantages of ordering and getting work from a distance, we would inform the manufacturers of Worcester, and others requiring Forgings to be duplicated, that we are now prepared to pay prompt attention to their orders, and furnish them with

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H. W. WYMAN.
L. F. GORDON.

January 1st, 1884.

Reproduced above is the formal announcement made January 1, 1884 of the partnership formed a few weeks previously in November of 1883 and known as the Worcester Drop Forging Works, later to be incorporated as Wyman & Gordon.

Today, after seventy-five years, Wyman-Gordon is still "prepared to pay prompt attention" to *your* orders and to furnish "forgings of the best quality," not only of steel, but of light alloys and all of the new exotic heat-resisting materials including beryllium.

And through the years Wyman-Gordon has continued to concentrate on one product—forgings, and one standard of quality and service—the best.

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Established 1883

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Also Beryllium • Molybdenum • Columbium and Other Uncommon Materials

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HARVEY, ILLINOIS • DETROIT, MICHIGAN

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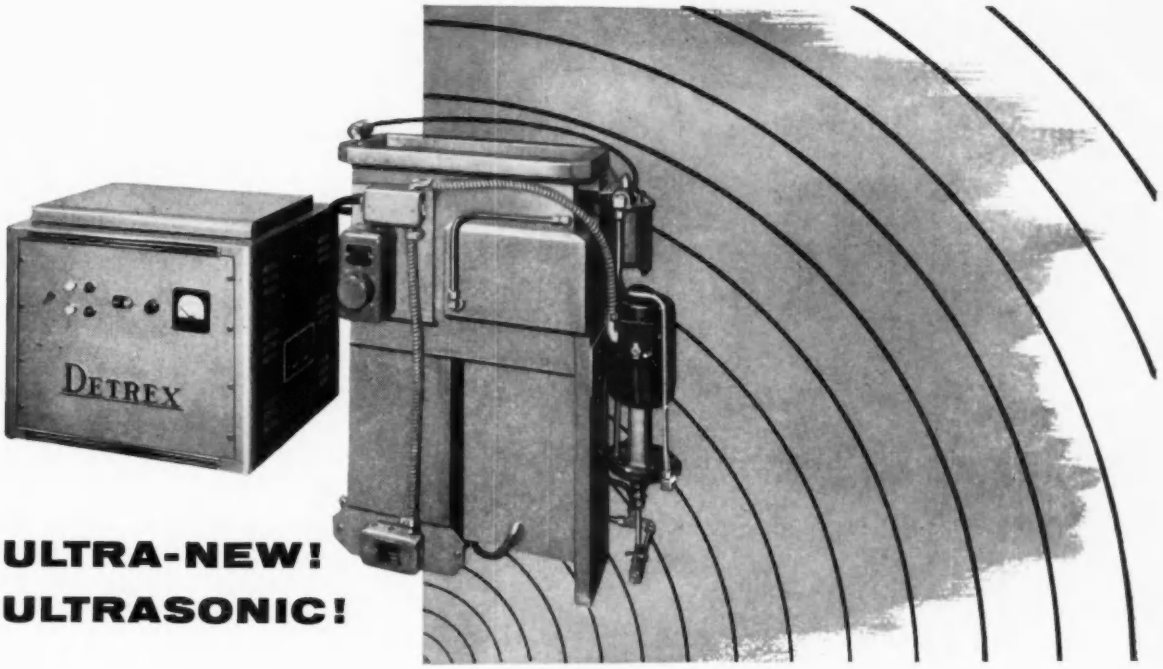

ULTRA-NEW!
ULTRASONIC!

DETREX ECONO-SONIC Unit Uses Sound Waves to Get Precision Parts Cleaner, Faster

Ultrasonic cleaning—a combination of solvent vapor degreasing and scrubbing action by high frequency sound waves—gets parts cleaner than is possible by any other method. Costs are reduced and production is increased.

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With its own filter, still, pump, heater, spray lance and model 600 generator, it is a complete, self-contained cleaning system. There is nothing else to buy and it installs in minutes.

Where hyper-critical specifications exist, Detrex can supply the additional stages necessary to accomplish an in-line cleaning system. Why not write today and let a DETREX representative show you how an ECONO-SONIC unit, or a larger ultrasonic machine, can improve the quality and reduce the expense of your metal cleaning operation.

Depend on DETREX for Every Metal Cleaning and Processing Need

- PERM-A-CLOR NA (Trichlorethylene)
- Solvent Degreasers
- Ultrasonic Equipment
- Industrial Washers
- Phosphate Coating Compounds
- PAINTBOND Compounds
- Aluminum Treating Compounds
- Alkali and Emulsion Cleaners
- Rust Proofing Materials
- Extrusion and Drawing Compounds
- Spray Booth Compounds

Send for T. J. Kearney's Informative Paper on Ultrasonic Cleaning Techniques.

DETREX CHEMICAL INDUSTRIES, INC.
Box 501, Dept. A1-559, Detroit 32, Michigan

World's Largest Exclusive Producer of Cleaning Chemicals and Equipment

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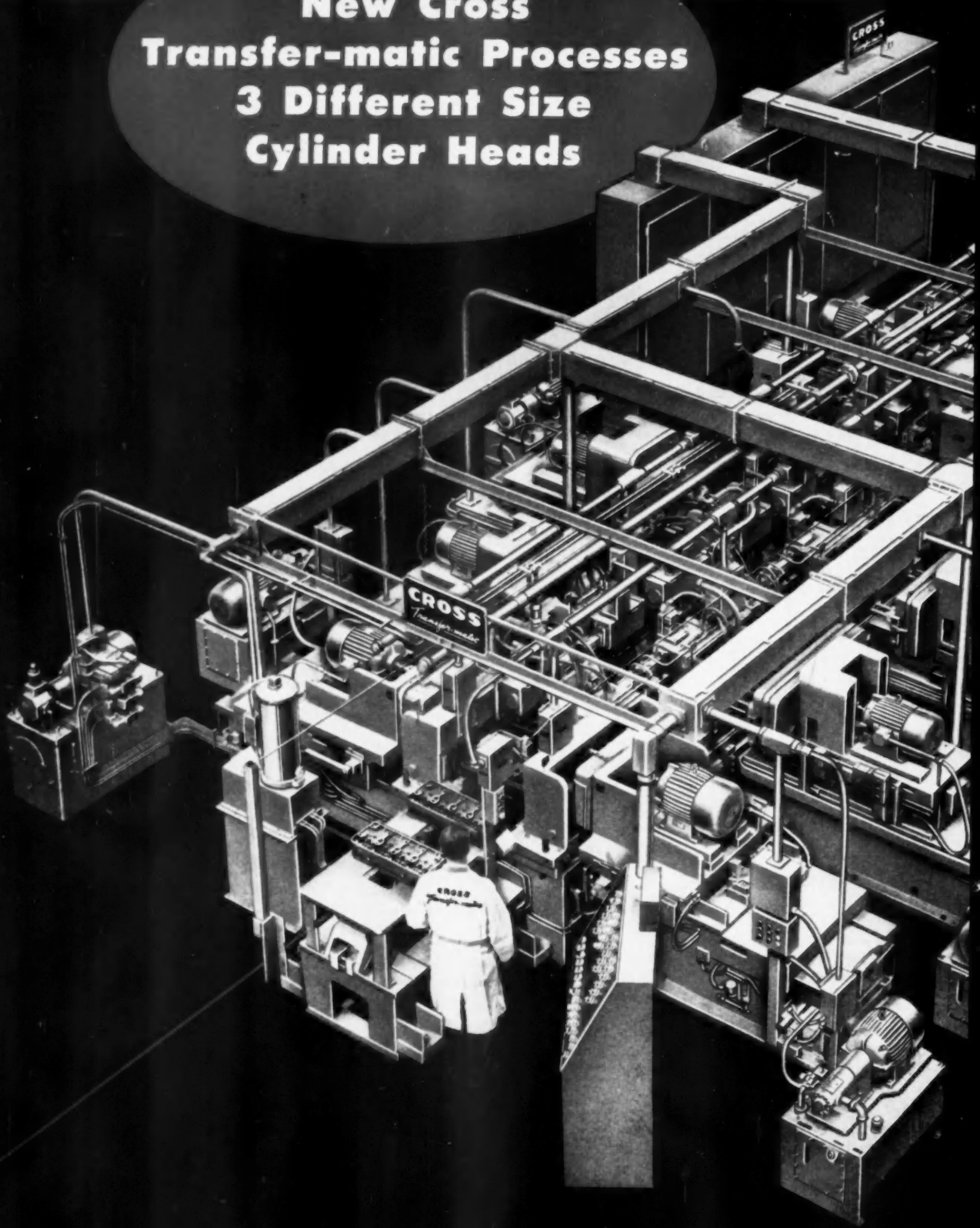
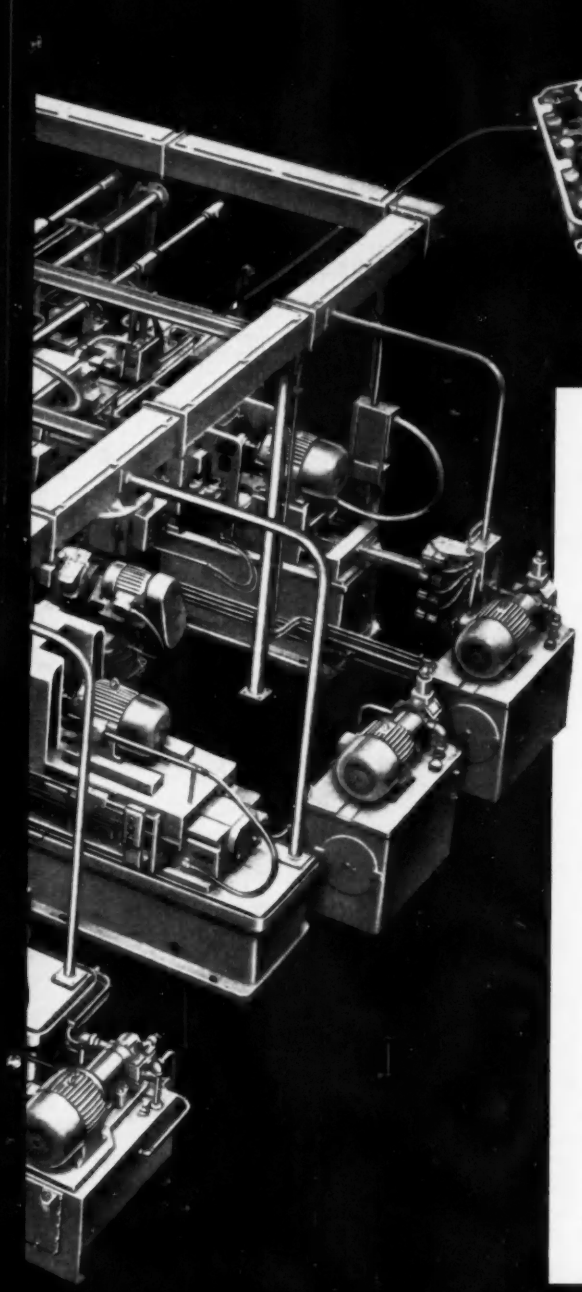
New Cross Transfer-matic Processes 3 Different Size Cylinder Heads



Another Automation First by Cross



This new Cross Sectionized Transfer-matic processes both ends of two, three and four cylinder diesel engine cylinder heads. Depending on head size being processed and optional methods used for drilling oil gallery holes (single pass drilling or step drilling) output ranges from 38 to 44 heads per hour at 100% efficiency. Operations performed include face milling, drilling, step or deep hole drilling, chamfering and tapping. At Station 13, oil gallery holes are air tested for casting density.

Processing of the three different size cylinder heads is accomplished by several quick revisions in machine setup; re-positioning fixtures to allow for different part lengths, re-locating positioning units and feed dogs on machine units and several tool changes.

Part transfer is accomplished by a lift and carry mechanism that prevents scratching and scuffing of machined surfaces. Fixed transfer points incorporated in the transfer carrier are common for the two and four cylinder heads while a second set is incorporated for the three cylinder head.

In processing the three heads, water outlet pads, oil gallery and fuel oil hole bosses on both ends are face milled at Station 4; the oil gallery holes are step drilled (or deep hole drilled) at Stations 6, 7, 9 and 10 and chamfered at Station 12. The fuel oil hole on the three and four cylinder heads only is step drilled at Stations 6 and 7 and chamfered at Station 10. Four screw holes are drilled and chamfered at Stations 6, 7 and 10. Following air test of oil gallery holes at Station 13, all holes are tapped at Stations 15 and 16.

For optimum flexibility in processing part design changes or entirely new parts, all machine units, feed units, wing bases and transfer mechanisms are completely standardized in design, dimensions and tolerances. In addition, all standard and special parts are completely interchangeable for easy maintenance.

Other features include construction to JIC standards, hardened and ground ways and automatic lubrication.

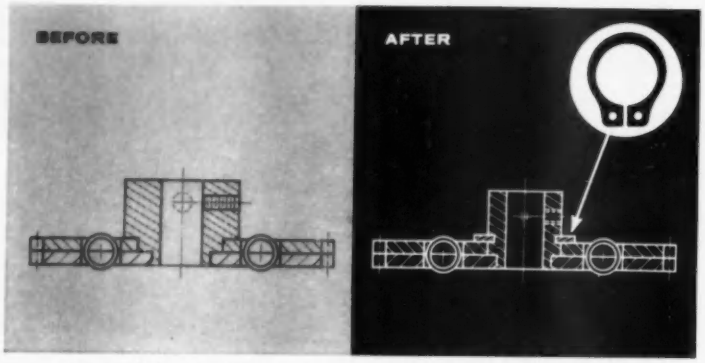
For additional information on this new Transfer-matic, write, wire or phone.

Established 1898

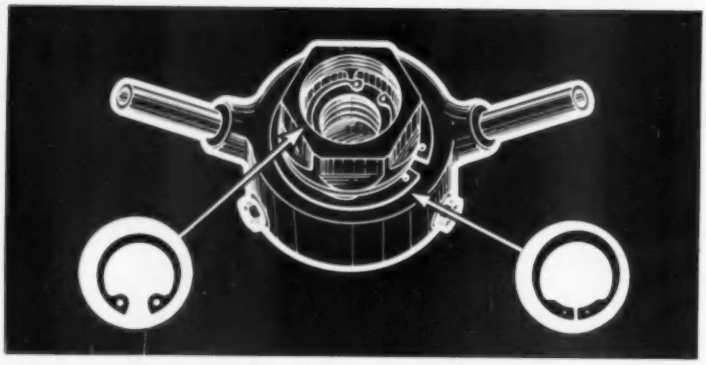
THE CROSS CO.

First in Automation

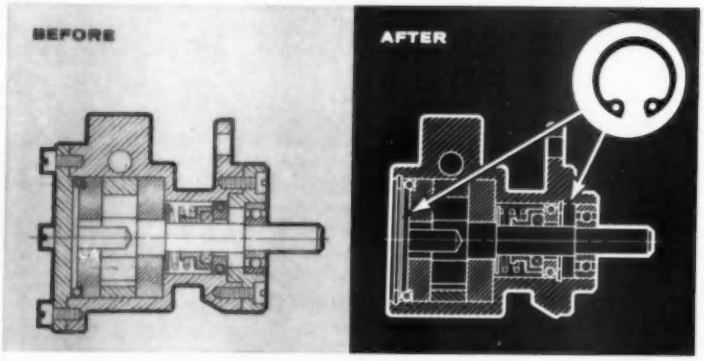
PARK GROVE STATION • DETROIT 5, MICHIGAN



Gear assembly improved. A Waldes Truarc Series 5100 retaining ring in this anti-backlash gear assembly eliminates machining and staking operations, reduces hub size, and allows easy disassembly, after gears are cut as a unit, for faster, better deburring. **Typical savings: $350.00 per 1000 units.**



Threaded retainers eliminated. In this self-sealing coupling, costly internal and external threaded retainers were eliminated by easy-to-apply internal (Series 5000) and external (Series 5108) Truarc retaining rings. **Savings per unit amounted to $4.02.**



End-cover design simplified. In this general-purpose pump, two Waldes Truarc, Series 5000, internal retaining rings make possible the elimination of two cover-plate castings (plus machining) and eight screws (plus drilling and tapping). Weight and dimensions are reduced and assembly and disassembly are greatly facilitated. **Typical cost savings: $1.48 per unit.**

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WALDES
TRUARC®
RETAINING RINGS
Waldes Kohinoor Inc., Long Island City 1, N.Y.

Designing for axial assembly with Truarc retaining rings

eliminates parts, machining, speeds assembly, simplifies maintenance

The proper application of retaining rings on or in axial assemblies can often effect startling simplifications and economies in design when compared to corresponding designs with conventional fastening devices. A few typical examples, using basic types of retaining rings, are shown in the accompanying drawings.

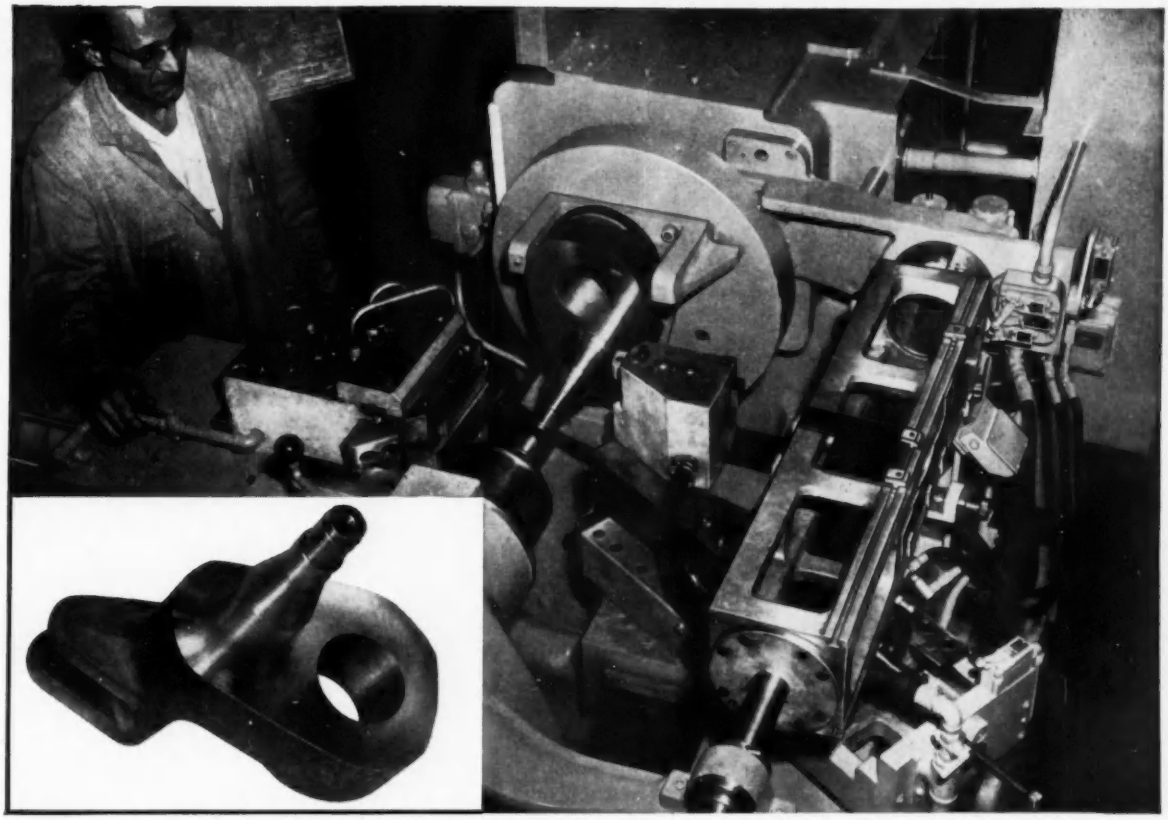
Threading, tapping, drilling, facing and other costly, time-consuming operations can be eliminated. Retaining rings are already in wide use in a tremendous variety of equipment ranging from household products to high-precision military gear designed for use under the most severe environmental conditions. They are quickly and simply installed in easily cut grooves which can often be machined simultaneously with other operations. The rings can frequently replace bulkier, more costly fastening devices—such as nuts, screws, studs, threaded sleeves and retainers, cotter pins, set collars, rivets and machined shoulders.

What's more, rings frequently make practical designs which could be achieved with no other known fastening device.

Although the ring types shown here are basic, Truarc retaining rings come in 50 functionally different types, as many as 97 different sizes within a type, 6 metal specifications and 13 finishes. You'll find detailed descriptions of Truarc retaining rings and assembly tools, plus more than 70 typical applications in the new 24-page catalogue RR10-58. Write for your copy today.

And remember, Waldes engineers are always ready to help you solve your application problems—whether it involves one of the standard Truarc rings or a "special" to fit your particular requirements. Waldes Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, N. Y.

TRUARC RETAINING RINGS...THE ENGINEERED FASTENING METHOD FOR REDUCING MATERIAL, MACHINING AND ASSEMBLY COSTS



Whips problem part with right equipment

Handles tough, interrupted cut and contour machining easily with Gisholt No. 24 Automatic with JETracer

Here's how this producer is holding floor-to-floor time on military tank idler arm forgings—18″ long with 5½″ major radius—to just 21.1 minutes.

The job is done with the powerful Gisholt No. 24 Automatic Production Lathe, using a JETracer on the rear independent slide, plus a 2-speed motor for correct machining speeds when facing and turning.

With the part held between centers, a special face plate fixture locates the work and drives against the large O.D. radius. All cuts are made separately; each slide performs a rough and finish pass. The front tool slide faces at 60 r.p.m. and .015″ feed (306 f.p.m.) and has automatic tool relief. Two tools divide the length of cut to shorten machining time. A special step-over cam arrangement repositions the front carriage and its tools for the finish pass.

The JETracer uses a 4-position indexing cam roll (permitting up to 4 automatic passes if needed), and controls the rear slide which turns all diameters on the idler arm at 180 r.p.m. and .015″ feed (259 f.p.m.).

Whatever your production picture on large parts—long steady runs or small repeat lots—you'll find proven ways to cut costs with the Gisholt MASTERLINE No. 24 Automatic Production Lathe. One operator handles 2 or more of these powerful machines, or does other jobs during machining time, because all machine functions are automatically controlled. Setups and change-overs are fast and simple.

For complete details on the No. 24 and other Gisholt machines, call your Gisholt Representative today. He has the facts, and his wide experience may point the way to more profitable production in your plant.

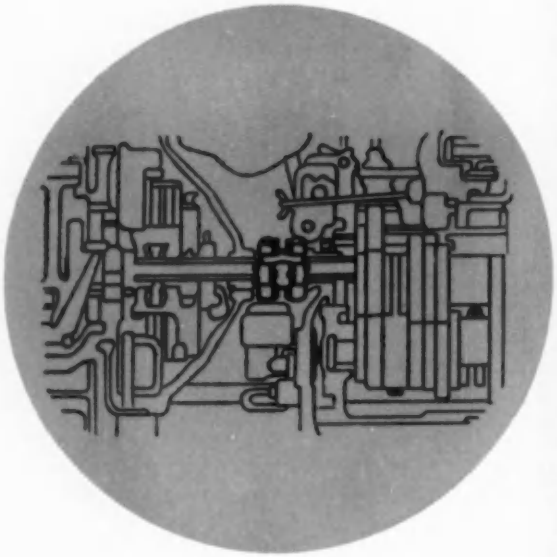
MASTERLINE GISHOLT SINCE 1887 GISHOLT

GISHOLT MACHINE COMPANY

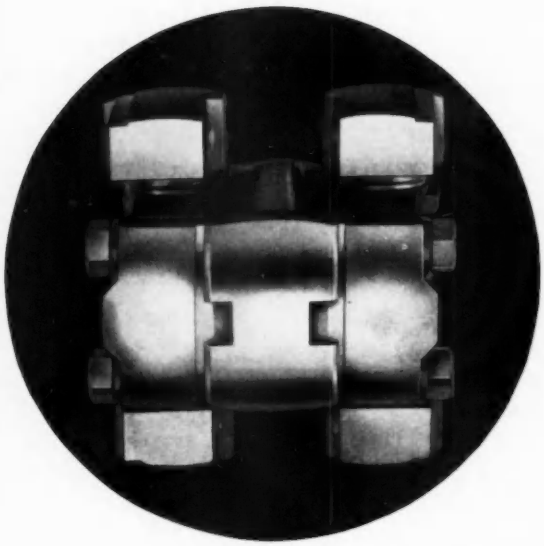
Madison 10, Wisconsin, U.S.A.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS

If Limited Space Is Your Problem



Specify This Close-Coupled Joint



MECHANICS

Roller Bearing UNIVERSAL JOINTS

For Cars, Trucks, Tractors, Farm Implements, Road Machines, Industrial Equipment, Aircraft

If you are faced with the problem of locating a universal joint in a space where limited clearance does not permit the use of a flanged joint, MECHANICS close-coupled Roller Bearing UNIVERSAL JOINT is your solution. This joint is specially designed for operation within cramped quarters that engineers formerly considered too short to accommodate a universal joint. Let our engineers show you how MECHANICS close-coupled UNIVERSAL JOINTS will conserve space, compensate for offset shafts and provide ample angularity in your new, compact models.

Export Sales: Borg-Warner International
79 E. Adams, Chicago 3, Illinois

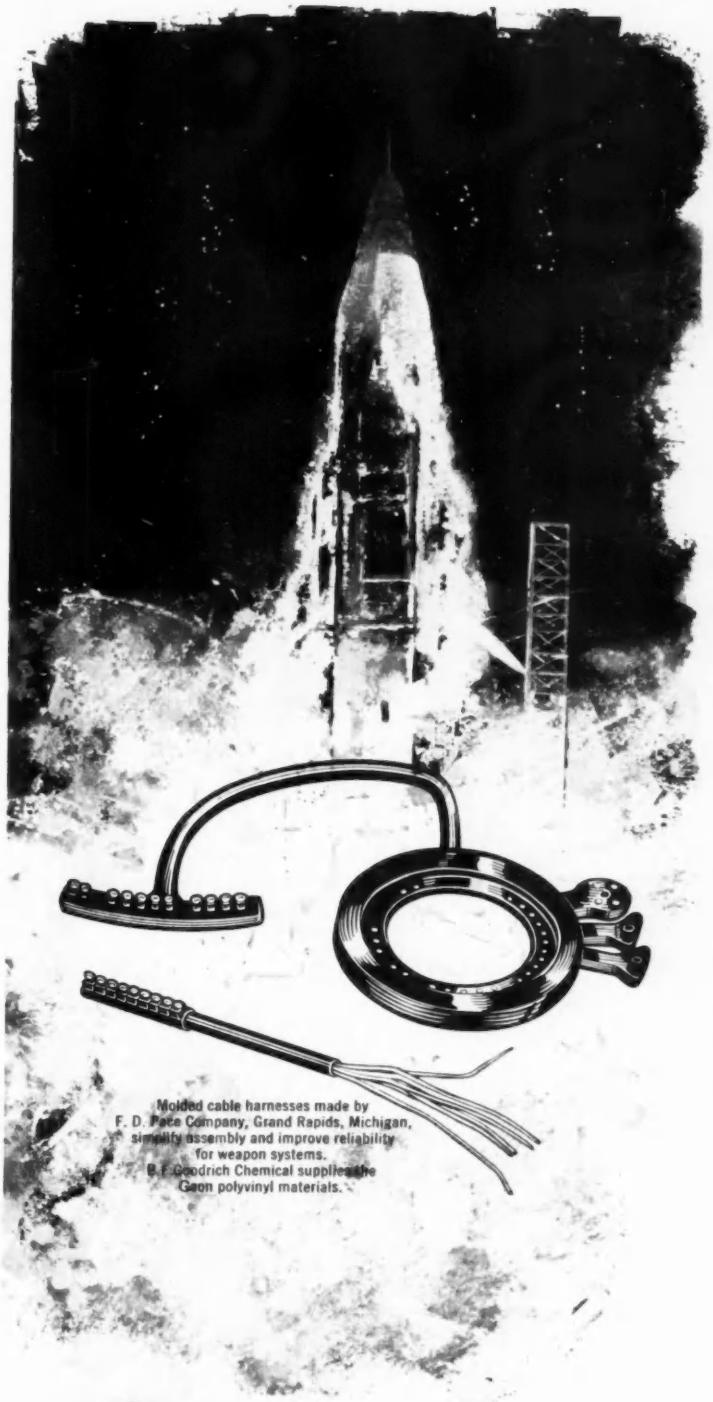
MECHANICS UNIVERSAL JOINT DIVISION

Borg-Warner • 2024 Harrison Ave., Rockford, Ill.

Circle 114 on Inquiry Card, for more Data

Another new development using

B.F.Goodrich Chemical *raw materials*



Molded cable harnesses made by F. D. Pece Company, Grand Rapids, Michigan, simplify assembly and improve reliability for weapon systems. B.F.Goodrich Chemical supplies the Geon polyvinyl materials.

Molded cable made with Geon guards weapon's sensitive "nervous system"

Firing modern weapons calls for extreme reliability—especially in the maze of interconnecting electrical components. To meet the needs of these complex installations, a new method of molding wiring harness and cable with Geon polyvinyl material has been developed that promises wide application on tough industrial applications, too.

Geon has many properties which make it ideal for moldings like this. Geon resists attack by most chemicals, heat, light and fungus. Geon also makes possible the right degree of flexibility and physical strength, which means that part of the load is taken off conductors and soldered joints. Since strain cables can be molded in, space consuming clamps can be eliminated. In addition, contacts, terminals and connectors can be molded to exact position to eliminate misconnections.

Geon also permits molding in any color to simplify coding. It's another example of the many ways Geon can contribute to new products or applications. Write Dept. AQ-2, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

Circle 115 on Inquiry Card, for more Data

Aristoloy leaded user reports 25% reduction in time required to cut worm gear threads

Cutting threads on worm gears is an expensive, time consuming operation. Geometry is critical and a considerable amount of metal must be removed. One of the large manufacturers of "worms," desiring to increase production, found that by switching to a *leaded* steel* he could increase both speeds and feeds. Equally important, expensive cutting tools lasted longer because of the freer machining characteristics of leaded steel—delivering more pieces between grinds, and drastically reducing down-time for tool changes.

Strength and hardness tests on the finished part, after heat treating, indicated no detectable difference in physical properties from unleaded grades previously used.

For complete information about Aristoloy leaded or standard analyses carbon, alloy, and stainless grades, write for booklet entitled, "A Complete Line of Leaded Steels," and new Products & Facilities Catalog. *Inland Ledloy License

ARISTOLOY STEELS

COPPERWELD STEEL COMPANY

ARISTOLOY STEEL DIVISION • 4025 Mahoning Ave., Warren, Ohio • EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 120, No. 9 May 1, 1959

Automobile Industry Welcomes Return of Spring Sales Upturn

The automobile industry has rolled out the welcome mat for the return of an old friend, the spring sales spurt, absent for the last three years.

Historically, the spring boom in car sales followed winter as closely as the first thaw, when the restless public got its first touch of wanderlust. But in 1956, sales did not pick up in the spring months. In 1957 and again last year, the same absence of the spring surge left total car sales lower than expected.

This year, things are returning to normal, according to March and April sales figures. Normal enough, in fact, to cause one automobile company executive to raise his forecast of total car sales. J. O. Wright, vice president of Ford Motor Company and general manager of the Ford Div., added 10 per cent to his predictions.

Last fall, Wright predicted an increase of 20 per cent over 1958 sales. Now, he has raised his prediction to 30 per cent, with a possibility of a six million car year. Ford's daily selling rate in the April 1-10 period was higher than any comparable period since model introduction.

Mercury daily selling rate in April 1-10 period was 81 per cent higher than during the first 10 days of March, and 32 per cent over last April's first period. Edsel also reported a good opening period, the best since model introduction and 56 per cent above last year.

Rambler continued its climb, delivering 11,732 cars during the first third of April, the second highest 10-day period in history.

At other companies, strong March sales pointed to the return of spring buying activity. Studebaker - Packard's March total was the highest in six years. Chevrolet's March sales were 21 per cent over a year ago with 130,580 deliveries.

PEUGEOT 403 STATION WAGON BOWS AT N. Y. SHOW

Peugeot unveiled its new "403" station wagon to the American public at the recent International Automotive Show in New York City. The 403, which accommodates six passengers, is built on a 114.5-in. wheelbase, has overall length of 181 in., width of 66 in. Vehicle is powered by 4-cylinder 89.6-cu in. engine developing 65 bhp at 4750 rpm. Wagon is priced at $2490 at East and Gulf Coast ports of entry.

Chrysler Corp. with fuller dealer stocks, is regaining some of the ground lost earlier this year through strikes. Chrysler expects to have strong sales right into summer. L. L. Colbert, corporation head, has predicted an ultimate 20 per cent of the market.

U.S. Health Dept. to Install Seat Belts on 1400 Vehicles

Seat belts eventually may be must items in all automobiles operated by the Federal Government.

The U. S. Health, Education, and Welfare Dept., paving the way, has ordered safety belts installed on its 1400 motor vehicles. Of the total number of vehicles, 580 are passenger cars.

Secretary Arthur S. Fleming, of HEW, says he was impressed by the lifesaving potential of the seat belt, as indicated in the Cornell University Automotive Crash Injury Project. Results of the accident study, he notes, indicate 5500 lives can be saved annually through use of the belts. He believes this to be a "conservative" number.

A branch of the HEW Dept., the Public Health Service, holds that all owners would be wise to install safety belts in their cars. In cooperation with automobile manufacturers, the National Safety Council, and the American Medical Assn., the Public Health Service is attempting to develop a national educational campaign on seat-belt use.

Motor vehicle accidents, according to a Public Health Service report, cause 40 per cent of all accidental deaths. Accidents of all types took the lives of an estimated 90,600 Americans in 1958. As killers, accidents rank fourth, trailing heart disease, cancer, and cerebral hemorrhage.

NEWS AUTOMOTIVE AND AVIATION

BUILD-IT-YOURSELF CAR

The pint-sized Noble 200, a British import seating four people, is offered as a ready-to-drive car or in do-it-yourself kit form. A man of average skills can assemble the 200 in 80 to 100 hours, using ordinary handyman tools, according to York Noble, the car's designer. Car is powered by Sachs 200 engine developing 10.2 hp. Complete kit sells for about $850.

Big Three Small Cars to Have Three Variations of Unit Body

The forthcoming Big Three small cars will employ three types of unitized construction.

The small Ford will use a fully unitized body patterned after Lincoln and Thunderbird. Front wheel housing panels and front sill will be an integral part of the body structure, with the fenders either bolted on or welded.

Thunderbird and Lincoln currently weld their fenders. It is conceivable, however, that Ford will adopt the bolt-on fender for its small car for easier replacement.

The Chrysler small car could be called "semi-unitized." From the front sill and firewall or toeboard, rearward the body will be unitized and much like the Ford body. Rear wheel housings, quarter panels and rear deck components will be a part of the basic body construction.

But the front end will be a separate subassembly, attached to the body. The front subassembly will include motor, torsion bar suspension, steering mechanism, and radiator. These components will be attached to a finger-type stub frame which probably will be bolted or riveted to the sill at the bottom of the firewall.

The front wheel housings and fenders then would be attached to the body structure as separate subassemblies.

The Chevrolet version could be called a reverse of the Chrysler body, since it also will be semi-unitized construction but with the engine at the rear. This means the front end sheet metal and members will be integral parts of the body structure, with rear end subassemblies added later.

The rear suspension, engine, transmission and differential will be mounted to a rigid cross member which could be termed the counterpart of Chrysler's stub frame. Rear wheel housings and fenders could be bolted or welded (probably welded) but would be added to the unitized body structure as subassemblies.

GM, Justice Dept. to Argue Record Dispute in N. Y. Court

Government attempts to subpena the records of General Motors Corp. will be argued in court in New York on May 18.

The U. S. Justice Dept. called on the car manufacturer earlier this year to produce its records. Records are required, the department said, as an aid in a grand jury investigation of possible anti-trust law violations in the automobile industry.

General Motors protested that the subpena would require the corporation to dig out an enormous quantity of information. Some of the data, the firm said, dated back to 1946 and, in some cases, to 1929.

GM attorneys will ask Federal Judge E. J. Dimock, in New York, to quash the subpena. Before the arguments are held, the Justice Dept. intends to file a reply to the GM motion for dismissal of the government order.

Detroit Harvester Pays Cash For Weaver Manufacturing Co.

Detroit Harvester has acquired the Weaver Manufacturing Company in a cash deal that makes the Springfield, Ill., automotive service equipment firm a subsidiary of DH. The move gives Detroit Harvester a total of three subsidiaries and six divisions. There are no plans for personnel or operating changes at Detroit Harvester's newest subsidiary.

Goodyear Tire Will Build $7 Million Plant in France

Goodyear Tire & Rubber Co. will build a $7 million tire manufacturing plant in France. According to board chairman E. J. Thomas, the plans and engineering work are well under way and a location will be selected in the near future.

The plant will be Goodyear's 29th overseas tire plant and the 58th in the company's worldwide manufacturing set up.

GM Transmitter Gives Vocal Traffic Signals

Drivers soon may get vocal traffic signals from roadside transmitters.

One such device already has been developed by General Motors Research and Delco Radio Div.

The new system, called Hycom—short for highway communications—consists of a low-frequency transmitter and transistorized receivers in cars. The transmitters, spaced along the highway at strategic spots, would give the driver audible alerts such as "ice patches ahead . . . slow to 20" or "Centerville exit one-half mile."

The receiver could be a separate unit (about the size of a transistor radio) or it could be a part of the regular car radio. If the radio is on, it is muted momentarily until the voice message is completed. GM figures three seconds is ample to get across a complete message.

GM believes Hycom will be valuable as a warning or alert to supplement the usual visual signals which the eye-weary driver might otherwise miss. This would be especially true in fog, rain or snow, or on unfamiliar highways and turnpikes.

Hycom is designed to operate in the 10-20 kilocycle range, far removed from standard broadcast bands.

It is an electro-magnetic induction system with a highly controlled signal that can be detected only in the zone of the transmitter's ferrite rod antenna. Hence, broadcast zones would not overlap and confuse the driver-listener.

The receiver, says GM, probably would sell for less than a standard car radio. Transmitters, also transistorized, would be relatively inexpensive, the actual price depending on highway engineers' specifications.

Rollert Succeeds Ragsdale As Buick General Manager

Edward T. Ragsdale, 61, retired as general manager of the Buick Div. of General Motors Corp. on May 1.

He was succeeded by Edward D. Rollert, 47, who has been general manager of the Harrison Radiator Div. of GM since 1955.

Mr. Ragsdale, who was with Buick for 36 years, served as assistant chief engineer, chief engineer, and general manufacturing manager. He was appointed Buick general manager in March 1956 and elected a GM vice-president a month later.

Rollert, who has been with GM since 1934, held posts with AC Spark Plug, New Departure Div., and BOP Div. of GM. He became head of Harrison Radiator four years ago.

Buick sales have been declining for the past few years. Latest registration figures show Buick in seventh place. Buick at one time occupied third place in industry sales.

Since sales of 1959 models began to lag, Buick has laid off several thousand production workers.

Federal Highway Safety Study Sheds New Light on Accidents

How safe is an automobile?

No one really knows the answer. There have been some generally accepted answers, which tell a small part of the whole story—answers such as "an automobile is only as safe as the driver wants to make it."

And there have been some sharp criticisms in recent years of the basic structural safety of the vehicle itself.

Now the Federal government has completed an exhaustive, three-year study that sheds new light on problems of vehicle, highway and driver safety. The 400-page report covers 3.7 billion vehicle miles, 290,000 drivers, and accidents involving 10,000 vehicles. The bureau of Public Roads made the study under the direction of C. W. Prisk.

Among the interesting highlights:

Low horsepower cars have an exceptionally high accident involvement rate. Daytime involvement is lowest at speeds between 55 and 70 mph, highest at speeds below 40.

Today's motor vehicles are structurally safer than any that have heretofore been manufactured, and the industry is giving increasing attention to many features of the vehicles that add to its safety.

But there still are "residues of weakness" such as defogging equipment, rear lighting for more positive identification, and positioning of instruments and foot pedals.

Brake improvements are urged; tail fins are described as vision-blockers in backing up; and improved knowledge of the basic causes of accidents is essential to progress.

Renault President Predicts Continued Rise in U. S. Sales

The small European-type automobile will continue to get a larger share of the U. S. market, according to Pierre Dreyfus, president of Renault of France.

He also said that Renault expects to sell about 100,000 cars on the U. S. market this year. This is a gain of more than 60 per cent over last year's sales total of 59,968.

Mr. Dreyfus made his predictions at a press conference in New York City last month. He came to this country to confer with officials of Renault's American marketing subsidiary, Renault, Inc.

Mr. Dreyfus said Renault is launching a new program to expand its American sales. The program:

- Launching a higher-performance model of the Dauphine, called the Gordini, as well as a new four-passenger sports car, the Caravelle.
- Improving the Dauphine to include a 12-volt electrical system, a new clutch, and a modified transmission.
- Consolidating its 800-dealer network, and its nationwide system of 15 parts depots, with a central parts depot in Brooklyn.
- A $4 million advertising campaign.

Meanwhile, the Automobile Manufacturers Association reported that automotive imports into the U. S. for the first two months of 1959 totaled 99,145 units, having a dollar value of $113,055,698 for the month of February alone, imports totaled 47,126, for a dollar value of $52,695,441.

Welding to Play Key Role In Space Age, Hoglund Says

Welding has become the key to the development of new space age alloys.

So says Gustav O. Hoglund, president of the American Welding Society and head of the Welding Section of the Alcoa Process Development Laboratory.

Mr. Hoglund spoke at the 40th annual meeting of the American Welding Society held at Chicago, Ill.

The week-long meeting featured papers by more than 100 welding experts from the U. S., Canada, and from countries in Europe and Asia.

The Annual Welding Show, held simultaneously at the International Amphitheatre in Chicago, displayed nearly $3 million worth of welding equipment, products, and accessories, claimed to be the largest assembly of equipment of this kind ever assembled under one roof.

ELECTRONIC "DETECTIVE" CHECKS COMBUSTION

This new electronic "detective," designed by Du Pont Co., ferrets out abnormal combustion symptoms such as knock, pre-ignition, rumble and thud that occur in high-compression engines. Conventional spark plugs in the test engine are replaced with special instrument plugs equipped with built-in, pressure-sensitive, piezo-electric crystals. The instrument translates electronic signals from the crystals into accurate data that tell what's happening inside the engine.

NEWS AUTOMOTIVE AND AVIATION

NEW TRUCK LINE FEATURES BIG PAYLOAD

This Mercedes-Benz 10½-ton truck, part of a new line, features a high load-to-vehicle weight ratio, semi-forward control, and improved frontal treatment with wraparound windshield. Power unit is a 311.2-cu in. six-cylinder Diesel which develops 120 hp at 3000 rpm and drives through a five-speed all-synchromesh gearbox. Hydraulic brakes have a single-chamber compressed air booster.

Ford's 50 Millionth Vehicle Built at Historic Rouge Plant

Ford Motor Company's 50 millionth vehicle, a 1959 Ford passenger car, came off the company's Rouge plant assembly line in Dearborn, Mich., April 29.

The milestone vehicle followed Ford's Job No. 1 by nearly 56 years, but trailed the 40 millionth unit by just six years.

The car was unique in its parts and component content. Nearly every Ford manufacturing plant in the country shipped parts for the vehicle. Outside suppliers also got into the act with specially designed parts.

Ford expects to build its next 50 million vehicles in less than half the time required for this milestone car.

Half a century ago, Ford was still working on the first million (reached September, 1915). It had only 1657 employes and barely 500,000 sq ft of plant floor space. Today, the company counts nearly 150,000 employes and measures 113 million sq ft of working area.

The Rouge plant, incidentally has turned out more cars and trucks than any other existing facility—nearly 3.7 million.

Pontiac Passes 1958 Output; Sales Run 52 Per Cent Ahead

Pontiac Div., new leader in the medium-priced field, already has built more 1959 models than it built in all of the '58 model year. Sales are running a full 52 per cent ahead of last year.

The division passed last year's output on April 14, when model No. 217,303 was built. Through April 17, Pontiac's calendar year total of 141,506 cars ranked third in the industry.

First quarter retail deliveries were 52.49 per cent above the same period of 1958. Daily sales rate in March, when 36,641 cars were delivered, was the highest since 1955.

Dodge "Silver Challenger" Offered as Spring Tonic

Dodge Div. is offering a new model, the "Silver Challenger," as a spring sales tonic. First deliveries of the limited-production models are scheduled for May.

The Silver Challenger, a two-door sedan on 122 in. wheelbase, is finished in silver metallic "Lustre-Bond" high-baked enamel. Interior trim includes silver metallic vinyl and black fabric.

Dodge is making the Challenger available with either the 135 six-cylinder engine (230-cu in., 8 to 1 compression) or the Red Ram V-8 (326-cu in., 9.2 to 1 displacement). Manual transmission is standard, but automatic is optional with either engine.

The Challenger features new tail lights and new rear fin treatment.

Suggested factory retail prices are $2530.50 for the six and $2650 for the V-8, including delivery, excise and handling charges.

M-E-L Boosts Output For Current Quarter

M-E-L Div. has boosted substantially its production schedules for the current quarter, anticipating a realization of the historical "spring surge" in car buying.

Production for the April-June quarter is being boosted 30 per cent for Mercury, 40 per cent for Lincoln and 302 per cent for Edsel over last year's totals. The quarterly forecasts are slightly below the first three months of this year, when dealer stocks still were being built up.

M-E-L plans to build 30,203 Mercury cars, 11,591 Edsels and 7281 Lincoln and Continental cars in the current period.

Edsel production, incidentally, will include a larger percentage of six-cylinder models. Sixes currently are running at better than one-fifth of all Edsel sales, and even the six-cylinder station wagon is selling at better than 16 per cent of all sales.

Chevrolet Will Take Over BOP's Framingham Plant

Another indication of the squeeze on the medium-price market: Chevrolet will take over GM's Buick-Oldsmobile-Pontiac assembly plant at Framingham, Mass.

The switch, to be completed before 1960 model production, will give Chevrolet its first assembly plant in New England and reduce the number of BOP plants to six. BOP operations will be transferred to Linden, N. J.

The move has nothing to do with Chevrolet's small car assembly plans. The small car's initial output will be at Willow Run, Mich., and any additional production would be in plants west of Michigan.

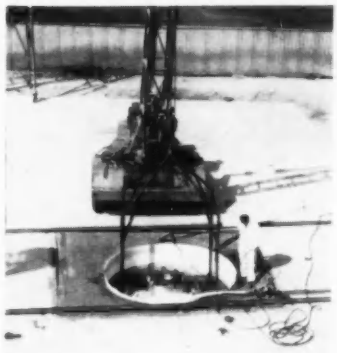
Fischer Body Div. also will move into the Framingham facility, creating a Chevrolet-Fisher relationship similar to the arrangement in other assembly sites.

GM anticipates increased employment at both Linden and Framingham because of the move.

Engineers Probing Mysteries Of "Off-Road" Wheel Behavior

Engineers at the University of Michigan's North Campus Automotive Laboratory are probing off-the-road wheel behavior and soil reaction.

Engineers at the laboratory are looking for a mathematical formula



EXPLOSIVE FORMING

Ryan Aeronautical Co. is blasting tough space-age metals into complex shapes with high explosives. The new technique, called high-energy forming, shapes parts in a fraction of a second. Shown here is a new explosive forming facility installed at Ryan's San Diego (Calif.) plant. Die and part are lowered into water filled pit, prior to detonating the explosive.

that will predict how a wheel of any diameter and width will respond at any given speed and load on various soils. The formula could be used to develop an improved wheel for off-the-road vehicles.

The long-range program is being conducted for the Army Ordnance Corps' Detroit Arsenal through the University's Research Institute.

One of the major steps, according to Prof. Edward T. Vincent, was proving a method of locating and determining the earth's force on a wheel. This, he says, should lead to the mathematical formula necessary for predictions.

Ford Set To Build Trucks In New Argentine Plant

Ford Motor Co. will build F-100 and F-600 trucks in a new plant in Buenos Aires under a plan approved by the Argentine government. Construction of the engine plant is scheduled to begin immediately.

Initial goal is 12,000 units in 1960, with production reaching 18,000 units by 1964. First trucks off the line will have about 40 per cent Argentine content, but the amount of national content will be "substantially increased," according to Ford.

Ford will make an initial investment of $15 million in the project. Much of the tooling and production equipment is expected to be shipped from the U. S.

Until late last year, Ford assembled vehicles in the Argentine with parts shipped from manufacturing plants in the U. S., England and Germany.

TABLOID

Mallory "28" metal, a new resistance welding alloy, combines good ductility and resistance to annealing at high temperatures with extremely high electrical and thermal conductivity, says P. R. Mallory & Co., Inc. Properties of the new alloy, which is made of copper and zirconium, were obtained through a combination of cold working and heat treating.

* * *

General Electric Co. scientists have developed a production line machine for detecting flaws in the aluminum jackets of uranium fuel elements. The new device ultrasonically tests the bonding between the uranium core and the jacket, measures the jacket's thickness by means of eddy currents, and shunts faulty units to a different production line.

* * *

A new plastic material that acts like rubber yet does not have to be vulcanized has been developed by B. F. Goodrich Co. The new material, known as Estane VC, resists tearing and the effects of abrasion, solvents, oil and ozone; when deposited in film form from a solvent, it has a tensile strength of 7000 to 8000 psi, Goodrich says.

* * *

Allegheny Ludlum Steel Corp. licensed the French firm of Stein & Roubaix to build and sell its consumable electrode vacuum melting furnaces throughout Europe. The furnace melts titanium, zirconium, stainless and high-alloy steels, and other space age metals.

* * *

Want to rent a measuring instrument? General Electric Co. has set up a nationwide rental service for small and medium-size shops that offers instruments for more than 70 different kinds of measurement. Rental fee: less than $75 a month for a deluxe oscilloscope that costs about $1500.

* * *

A new "one shot" method of producing polyether foam, which cuts manufacturing time and boosts quality, has been developed by General Tire & Rubber Co. The new process eliminates a number of intermediate steps and allows components to be added at the mixing head which produces the polyether foam.

Bendix Aviation Corp. is developing a variable-ratio steering gear based on obtaining control through ratio changes that follow a hyperbolic curve. The Bendix system, now in an advanced stage, is expected to be an improvement on existing automotive steering gear, according to the company announcement.

* * *

Tomorrow's tires will be molded from synthetic materials without cords, plies or costly fabrication, predicts Dayton Rubber Co. Tires made from solid urethane will hold normal air pressure indefinitely (because they are non-porous), will give at least twice the mileage of present-day tires, and will cost far less.

* * *

Dayton Rubber Co. announced it has boosted the horsepower ratings of its Cog-Belt line as much as 200-300 per cent over standard V-belt ratings by use of a new "design method." The new method is based on a five-year study of V-belt life, which analyzed data compiled in nearly 2 million test hours in the laboratories of the Dayton Industrial Products Division.

* * *

You can eliminate vapor lock by reducing the fuel system's restriction and temperature, stepping up its vapor handling capacity, and using a submerged pusher-type fuel pump. So says an Army research report: PB 131843, A Correlation of the Factors which Affect Vapor Lock in Automotive Fuel Systems, Price, $2.50. For copies, write Office of Technical Services, U.S. Dept. of Commerce, Washington, D. C.

* * *

A new method of fastening stainless steel trim to automobiles without leaving weld marks has been devised by Primeweld Corp., Dearborn, Mich. Key to the new method is the use of a low voltage and high amperage in welding the parts: the welder sends enough current through the pieces to quickly join the metals, but not enough to distort or discolor any of them.

AVIATION MANUFACTURING

Cessna 210 combines high-wing configuration with fully retractable landing gear

Cessna to Unveil Model 210C Single-Engine Plane in Sept.

Cessna Aircraft Co. announced it will unveil its advanced single-engine Model 210 in September.

The new model is "the first new single-engine, high-wing, retractable gear airplane to go on the commercial market," according to Del Roskam, vice-president and general manager of Cessna's commercial aircraft division.

Roskam said flight testing of the 210 is completed and that FAA certification and approval for production are expected shortly.

Although details on the new airplane will not be available until later this summer, Roskam revealed the 210 will be powered by a Continental 260-hp engine with fuel injection, and will have a cruising speed of 190 mph.

Roskam described the 210 as a four-place airplane with a high stability wing configuration and a fully retractable landing gear. Both main and nose gear are completely enclosed when the landing gear is retracted.

The 210 is designed to fit a market gap between the Cessna's $17,095 Skylane and the $59,950 twin-engine Model 310C. The standard 210 will sell for approximately $22,500, Roskam said.

Aerojet Launches Study Program For 1 Million Lb Solid Rocket

Aerojet-General Corp. announced it will make a feasibility study on a solid fuel rocket motor that will develop 1 million pounds of thrust.

The engine could be used as the first stage of a missile that would launch payloads of more than 1000 lb in orbit, Aerojet said.

Richard D. Geckler, Aerojet vice-president—Solid Rocket Plant, will head the new program. In charge of producing the high-energy propellants needed will be Dr. Karl Klager, chief of the propellant development division.

North American Reports Rise In First-Half Sales, Earnings

North American Aviation, Inc. reported net earnings of $13,240,000 for the six months ended March 31, compared with $12,881,000 for the first half of the fiscal year 1958.

Sales for the six-month period amounted to $476,742,614, compared with $462,684,730 for the like period a year ago.

Earnings for the second quarter increased to $7,339,000 from the $6,419,000 registered in the like period in 1958. Sales and other income for the second quarter totaled $255,913,541, compared with $239,835,575 for the comparable period a year ago.

J. H. Kindelberger, chairman, reported a backlog of unfilled orders on March 31, 1959, amounting to $766,371,387. This compared with a $513 million backlog at the start of the fiscal year (Oct. 1). This backlog figure does not include portions of new orders not yet finally committed, Mr. Kindelberger said.

Dayton Rubber Acquires Two West Coast Firms

Purchase of two West Coast aircraft equipment manufacturing firms by the Dayton Rubber Co. was announced by C. M. Christie, president.

One is the Hardman Tool and Engineering Co. of Los Angeles, reportedly America's largest aircraft seat manufacturer. The other is Aircraft Standards, Inc., of Santa Monica, Calif., engaged in the manufacturing and design of tools, dies and fixtures for the aircraft and missile industries.

Christie said both will become Dayton Rubber subsidiaries. Financial details in the acquisitions were not disclosed.

The Dayton Rubber president assumes the same post with the two new subsidiaries. T. P. Dougan, vice president of American Latex Products Corp., Dayton Rubber California subsidiary, becomes vice president.

Hughes 269A Helicopter Gets FAA Certification

Hughes Tool Co. announced its model 269A helicopter has received FAA certification, clearing the way for commercial and civilian use.

First models of the two-man helicopter already are undergoing operational tests by the Army at Ft. Rucker, Ala., and performance tests by the Air Force at Edwards AFB, Calif.

FAIRCHILD DELIVERS FIRST OF NEW F-27 PROPJET SERIES

First of a new series of Fairchild F-27 propjets has been delivered to Pacific Air Lines. New F-27 has 44-place capacity and is powered by Rolls Royce RDa7 propjets instead of standard RDa6. Pacific has ordered six of the new propjets and expects to start scheduled service May 1.

A civilian model of the 269A was given its first public demonstrations at the World Congress of Flight, at Las Vegas last month.

The vehicle is powered by a Lycoming 180-hp engine, has a gross weight of 1550 lb, and carries a useful load of 635 lb. It cruises at 85 mph, has a service ceiling of 11,000 ft, and a range of 195 miles.

Rae E. Hopper, Aircraft Div. vice-president, said the company foresees a number of uses for the craft outside the military field, such as in the petroleum, mining, agriculture and fishing industries, and in police, construction, utilities and forestry work.

Goodyear Building First Radar Prototype for Air Force BMEWS

Goodyear Aircraft Corp. is building a prototype of the first tracking radar antenna assemblies and radomes for the Air Force Ballistics Missile Early Warning Systems (BMEWS).

Stations in the BMEWS system will detect and track enemy ICBMs while they are still over enemy territory.

Under terms of a multi-million dollar subcontract with Radio Corp. of America, the prime contractor, Goodyear has designed and phased into production antenna dishes and 3-story-high pedestals to support them.

Goodyear is also constructing a prototype 140-ft rigid spherical radome to protect the units.

BMEWS radars will be located at Air Force installations in the far north and are designed for cold weather operation down to —65 F.

The system will feature RCA-designed tracking radars and General Electric detection radars. The radars will detect and track a missile as it appears above the horizon and an electronic computer will figure its course and probable destination.

Contracts for Two Jet Planes To Give Work to 20,000 Firms

Two new advanced jet planes will mean business to some 20,000 firms throughout the nation's industrial complex, the prime contractor says.

The two new planes are the F-108 long range interceptor and the B-70 strategic bomber. Subcontracts will be given to this huge number of firms, according to President J. L. Atwood of North American Aviation Inc., prime contractor for both planes.

Spreading the work between a large number of subcontractors is the best way of developing the two planes at a minimum cost, Mr. Atwood says. For one thing, it provides advantages of fast devision-making by an organization geared to the program and familiar with its every aspect.

In addition, it means that responsibility for coordinating all parts of the program clearly assigned.

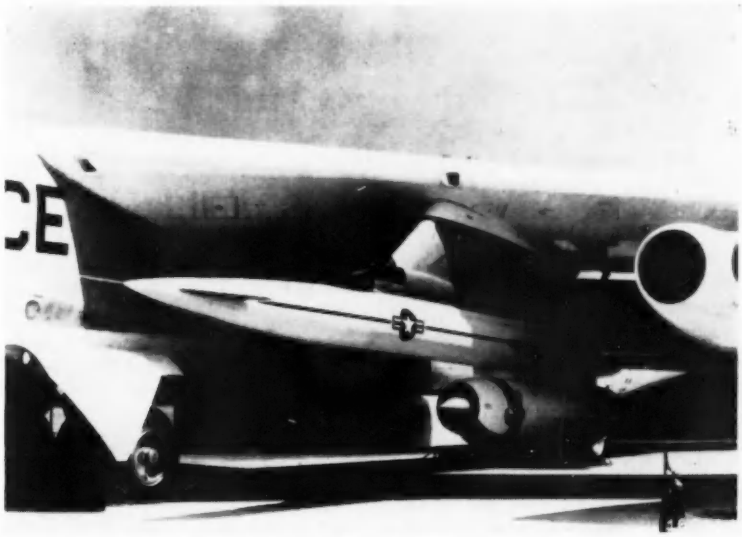
Solar to Build Thrust Chambers For NASA Research Vehicle

Solar Aircraft Co. has been chosen to produce new lightweight rocket thrust chambers for a research vehicle being developed by the National Aeronautics and Space Administration.

Solar said it will use a new technique to build the chambers that is expected to cut engine weight without loss of thrust.

The chambers will be formed of a system of U-shaped metal channels enclosed with a brazed wrapping of fine-gage metal ribbon. This method permits greater flexibility of design and more effective cooling than the hourglass-type configuration previously used, Solar said.

The heat treat process, according to Solar, consists of cooling the completed chamber to 100 F below zero and then heating it to about 900 F.



B-52 BOMBER SHOWN WITH "HOUND DOG" MISSILE

Air Force photo shows training and test model of "Hound Dog" air-to-surface missile hung on wing of a B-52 bomber. Hound Dog will take off from this position when airborne and fly to a selected target.

MEN IN THE NEWS

Stewart - Warner Corp.—Bennett Archambault, president and chief executive officer, was elected to the additional post of chairman of the board.

Budd Co., Automotive Div.—Gilbert F. Richards was appointed vice-president in charge of automotive sales.

Reynolds Metals Co. —J. Donald Shircliff was made regional automotive sales manager.

General Motors Corp., AC Spark Plug Div. — **Milton Stratton** was named director of the new quality control division and **Harold C. Yost** director of reliability.

Thompson Ramo Wooldridge Inc.—**Emil F. Gibian** was appointed director of industrial engineering.

Wesson Co.—**Sy Dworecki, James J. Smith, Jr.,** and **Gerald Bogner** have been elected vice-presidents.

U. S. Steel Corp.—**Boyd P. Doty, Jr.,** was made general sales manager of American Steel & Wire Div.

Dodge Div., Chrysler Corp.—**Richard D. McLaughlin** was made Dodge promotions programming manager.

S-P Mfg. Corp.—**J. Harry Adams** has been named Northern Ohio district sales manager.

Goodyear Tire & Rubber Co. of Canada—**L. E. Spencer** was elected president and general manager, succeeding **R. C. Berkinshaw,** who is now chairman of the board.

Chrysler Corp.—**Roy K. Kraebber** has been appointed plant manager of the Amplex Div. and **Vance T. Wray** manager of the new McGraw Glass Plant.

Bendix Aviation Corp., Cincinnati Div.—**Charles P. Boegli** was made supervisory engineer.

Douglas Aircraft Co.—**Robert W. Bratt** has become chief of the new Aerophysics laboratory.

Cornell Aeronautical Laboratory Inc.—**Dr. Alexander H. Flax** has been named vice-president, technical director.

Babcock & Wilcox Co., Boiler Div. —**Charles T. Smith** has been appointed assistant marketing manager.

Taylor Fibre Co. — **Earl Erdman** was named group leader for the resins research section.

Standard Pressed Steel Co.—**James C. Humphries** is now West Coast district manager in charge of aircraft-missile fastener sales.

General Electric Co.—**Guy E. Warner** was named sales manager of process computers for the Computer Dept.

Walker Mfg. Co., Original Equipment Div.—**Rex L. Curry** has been appointed sales engineer.

Standard Screw Co.—**Bruce E. Olsen** was promoted to chief engineer for the Stanscrew fastener line.

General Motors Corp. — **George Russell** was elected executive vice-president, finance.

General Electric Co., Chemical and Metallurgical Div. — **Robert J. Prochaska** has been appointed advance development specialist in the Chemical Materials Dept. polycarbonate engineering section.

La Salle Steel Co.—**A. Loring Rowe** was made vice-president and secretary.

General Motors Corp., Delco Products Div.—**Samuel W. Blanton** has been named sales manager, automotive products; **J. Fred Howe,** sales manager, distributor sales; and **Edward P. Czapor,** manager of marketing and new products planning.

U. S. Steel Corp., American Steel & Wire Div.—**M. E. Capouch** was promoted to manager of distribution and availability and **William H. Gutrel** to manager of marketing.

Solventol Chemical Products, Inc.—**Robert W. Huffman** was elected president and general manager.

LeTourneau - Westinghouse Co. — **Wayne H. McGlade** has been named product development manager—earth-moving and related equipment.

Trent Tube Co.—**Lyle E. Baker** has been appointed general sales manager.

White Motor Co.—**Richard C. Bryan** has been named manager of manufacturing and **A. C. Schliewen** works manager.

Joseph T. Ryerson & Son, Inc.—**John A. Houston** is now general manager of the Dallas, Tex., plant.

U. S. Industries, Inc., Clearing Div.—Roland L. Guerin, Jr., was named sales manager of the Aircraft & Missiles Div.

Air Reduction Co., Inc. — E. R. Humann has been named director of purchases.

Necrology

Charles B. Johnson, 55, head purchasing agent for Chain Belt Co., died Mar. 30.

Joseph J. Morsman, Sr., a retired director of National Lead Co., died April 1, at Chicago, Ill.

John L. P. Brodie, 59, engineering director of The de Havilland Engine Co. Ltd., died Mar. 23, at London, England.

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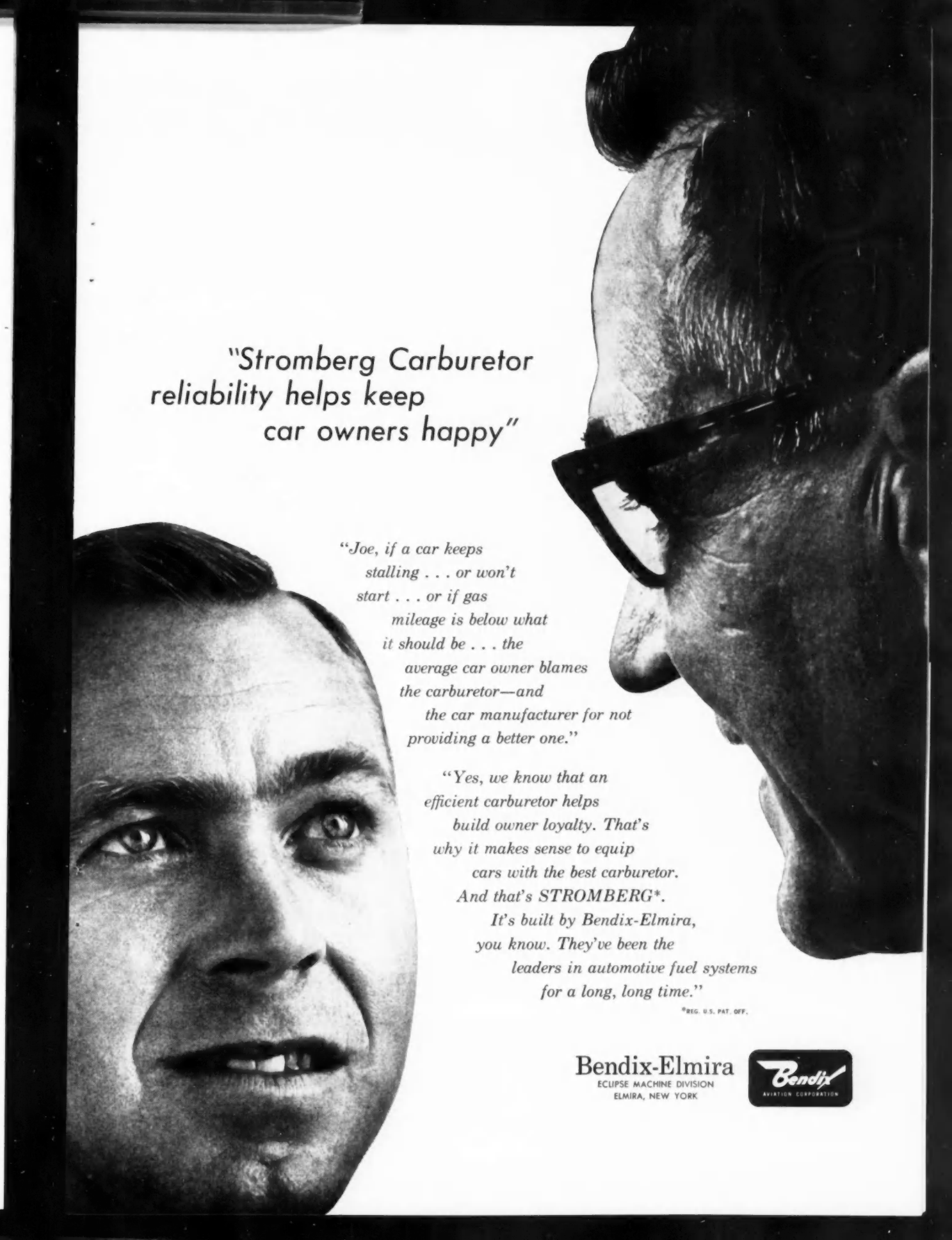
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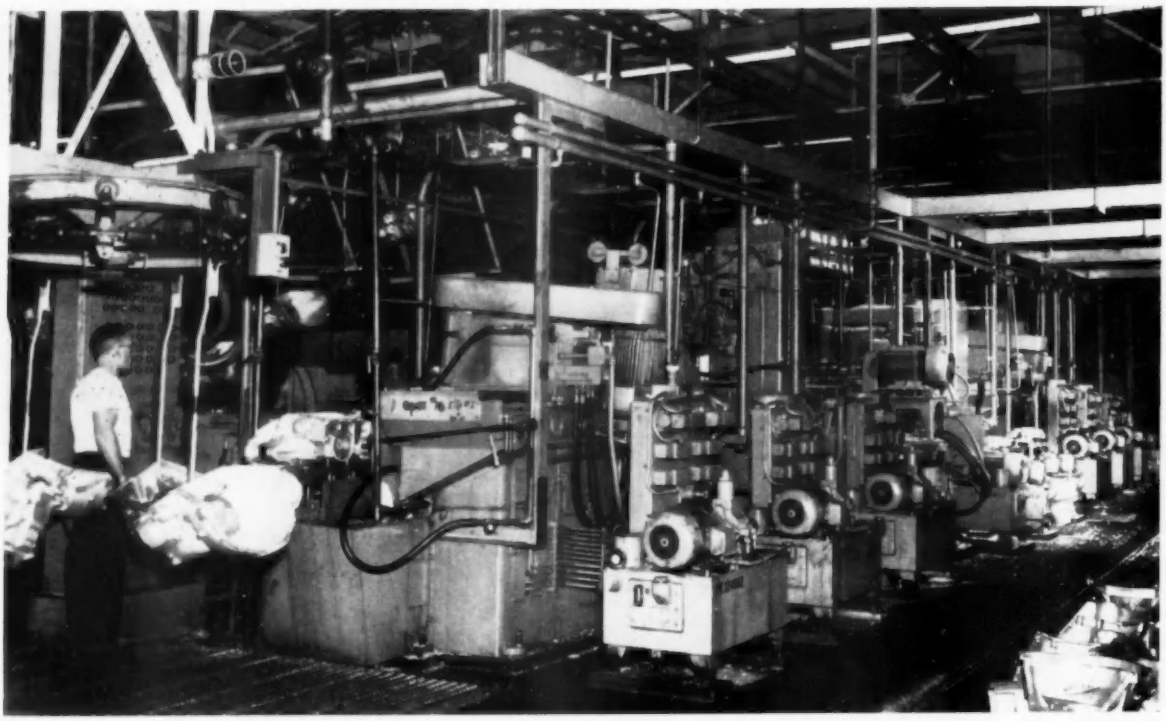


Perspective of portion of the Cincinnati transfer machine on the transmission case line. This is the first operation preparatory to machining on two other transfer lines in this area. The operator is seen at the loading station.

Aluminum Transmission Cases Machined on Automated Lines

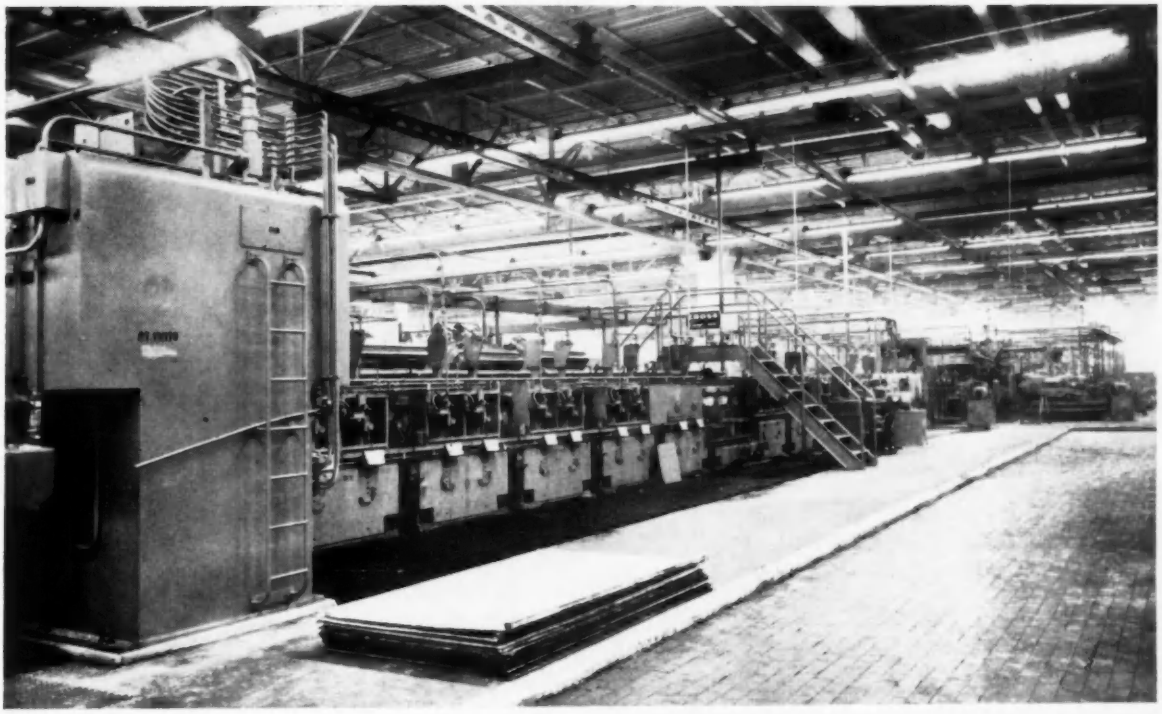
Ford Motor Company's Automatic Transmission Plant at Sharonville, Ohio, Is Equipped with Latest Types of Machine Tools and Transfer Equipment

PART I

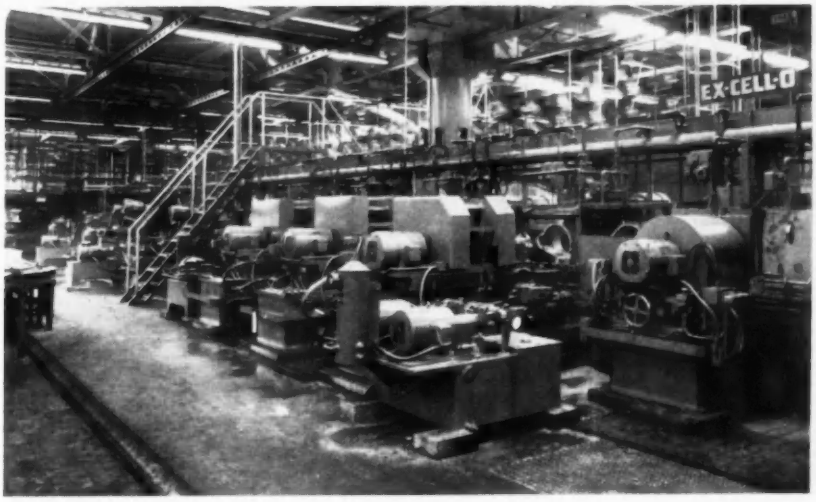
EACH new manufacturing facility usually represents the most recent advances in techniques, often introduces new concepts and "firsts" in production applications. This is particularly true of the Sharonville (Ohio) Automatic Transmission plant of Ford Motor Co. With a floor space of over 1.53-million sq ft in the manufacturing building this plant is devoted exclusively to the building of the latest type Ford automatic transmissions introduced for the 1959 model year. Four different models are produced for Ford engine operations.

As may be expected, Sharonville boasts the latest types of machine tools and transfer equipment. Automation has been carried out to the maximum degree, in many respects exceeding the mechanization in existing Ford plants. From the standpoint of material handling it is of interest that the plant has over 50,000 ft of monorail conveyors.

Since Sharonville makes all of the components for the transmissions assembled here, including the torque converter assembly, an enormous amount of process is involved, in fact far too much to permit of coverage in a single article or even a series of articles. The best this



The largest transfer machine section found on the transmission case line is the Cross machine, part of which is shown here. It consists of two transfer machines tied together for continuous processing.



The third transfer machine on the transmission case line is the Ex-Cell-O unit shown in this view. This completes precision boring and facing operations.

By
Joseph Geschelin

writer can do is to present a condensed picture of the making of a selected group of typical components.

This article, the first in the series, will be confined to a brief description of the transfer line for producing the transmission case and the extension. It may be noted at this point that Sharonville has two lines for transmission case machining: a "short" line designed to machine a single high production case; and a "long" line considerably longer physically, which is capable of rapid changeover for three different cases or, in fact, for all four cases. Obviously, this line is longer due to the inclusion of numerous "idle" stations which can be activated for a given case.

Both case lines contain similar transfer machines and this article will describe the long line. It consists essentially of three large transfer machines — a Cincinnati group for the preparatory operations; an enormous Cross group for boring, drilling, and tapping; and an Ex-Cell-O transfer unit for precision-boring, facing, etc. The case is an aluminum permanent mold casting, made in one piece with the flywheel housing, weighing 24 lb in the rough, 20.5 lb finished.

Operations begin with the 26-station Cincinnati transfer machine which handles all milling,

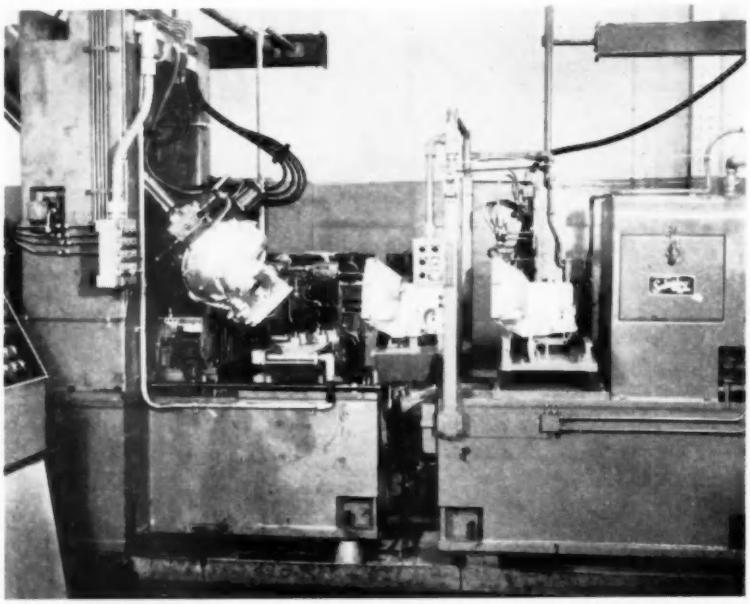
certain roughboring stages, and a variety of locating holes. The case is positioned with pan face up for rough-milling, then two locating holes are drilled to provide fixture locating for succeeding operations. Next comes the drilling of six, 0.750-0.755 in. prelocator holes and finish-milling of pads. This is followed by the roughboring of six large diameter bores while the case is still located on the pan face. This is done with the left hand head at Station 8, the right hand head handling counterboring and chamfering of a large diameter, and facing several surfaces.

At station 10 the case is turned to present the mounting face for milling at the left side; rough-milling the valve body pad surface on the right side. At Station 12 the case is turned again to finish-mill the flywheel cover face; and drill one hole part way through. At Station 14 the case is presented with the pan face up to finish-mill the angular surface. Next comes the boring of the two locating holes to a finish diameter of 0.6250-0.6245 in. The case then is rolled over, locating on the finish-milled pan face and at Station 20 the front pump face and the thrust face at the rear are rough-surfaced. Station 22 handles additional rough-boring, chamfering, and counterboring operations. Stations not mentioned specifically are either idle or transfer stations.

The Cross transfer line consists of three sections—for operations 20, 30, and 40 respectively. The first section — Operation 20 — is composed of 26 stations some of which are idle for specific cases. The case is located on the pan face and with the two bored locator holes. This machine drills, chamfers, counterbores, countersinks, reams, and taps a large number of holes in various areas of the case. Since some of these are drilled part-way several times and since the tapped holes have to be drilled initially, the machine is equipped with a much larger number of spindles than there are holes. Roughly there is a total of 68 drilling spindles, some of which are combination drills; 23 spindles for chamfering; 14 for countersinking; two for counterboring; 25 tapping spindles; and 15 spindles for reaming.

In addition to these Station 9 is tooled to counterbore and surface face in certain areas; while Station 14 probes three holes. At Station 20 the left head blows out

Loading station of the Buhr Economatic transfer machine which completes the machining of transmission extensions. As seen in this view the Buhr machine extends into the background at the left. Note the big control cabinet for this transfer machine, outlining the entire machine as well as individual heads. Tell-tale lights on this board indicate OK or trouble at any station. Extensions go through at the rate of 140 per hour.



Orienting and transfer station at the end of the Cross transfer machine. Cases emerge from the Schmieg precision washer at the right and are picked up by the orienting fixture at the right to present the work in proper aspect for Ex-Cell-O operations. This fixture is typical of a number of special indexing fixtures built into the Cross transfer machines.

and probes a group of 18 holes; while the right hand head handles nine. Leaving operation 20 the case is indexed 90 deg to have mounting face leading as it enters the second Cross unit—Operation 30.

Whereas operation 20 took care of holes in the front and rear face as well as the top of the case, operation 30 handles the gamut of drilling, boring, and facing operations mainly on the sides of the case in the next Cross transfer machine. In the initial stages three heads are employed for roughing out the diameters of the servo cavities on both sides. These operations include rough-boring, chamfering, and counterboring. Another head combination roughturns and bores a smaller diameter; drills four holes; and hollowmills the boss in the servo cavity on the right hand side. Station 6, left side completes operations on this servo cavity including the generating of two bosses, facing the small boss, and facing the outside face of the servo. The right hand head works on the opposite servo to generate a 5-in. diameter boss and screw lugs.

Now that the servo cavities have been prepared, the succeeding stations take care of the drilling, reaming, and tapping of a variety of holes. An interesting feature of the Cross unit for Operation 30 is that the machine is designed for changeover in three different patterns: the first has a head pattern suitable for machining all four cases; the second and third, each for a specific case.

The brief description here covers the first sequence along 34 stations of the machine.

In addition to the preliminary operations on the two servos, this unit has 29 drilling spindles; one countersink; 11 chamfering spindles, 12 reaming spindles; 15 tapping spindles; one spotfacing spindle; one end milling operation. Probing is done at a number of stations as follows: Station 15 RH probes eight holes and in addition drills one hole and roughcounterbores a small bore; Station 15 LH probes 13 holes, making this a rather active station; Station 30 probes two holes.

As the cases are completed at operation 30 they are indexed automatically to present the work with bell end up and pan face to the right side of the machine. This moves the case into the third Cross transfer machine—Operation 40—consisting of 40 stations.

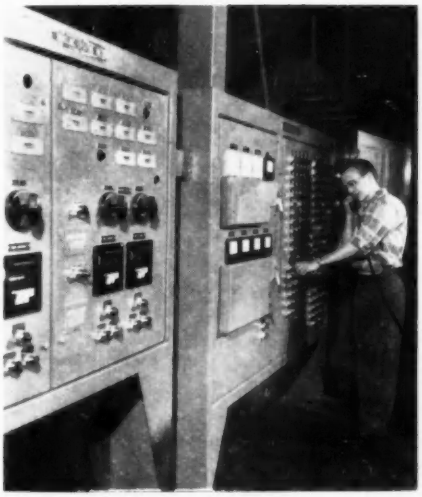
Operations in this machine include drilling, tapping, spotfacing, etc., on the areas available in this position of the work. This unit is concerned with a number of deep holes which require step-by-step drilling at various stations. It has 57 drilling spindles; eight reaming spindles; 30 tapping spindles; 30 countersinking spindles; four spot facers; two counterbores. Supplementing these spindle stations are a number of stations exclusively for blow-out and probing: Station 17 handles 18 holes; Station 18, 14 holes; Station 29 and 35 five holes each.

Following passage through the extensive operations in the Cross line, the case moves into the 28-station Ex-Cell-O transfer machine. It rests on the finishmilled pan face with the motor mounting face to the left side of the machine to present the front and rear bores to the machine spindles.

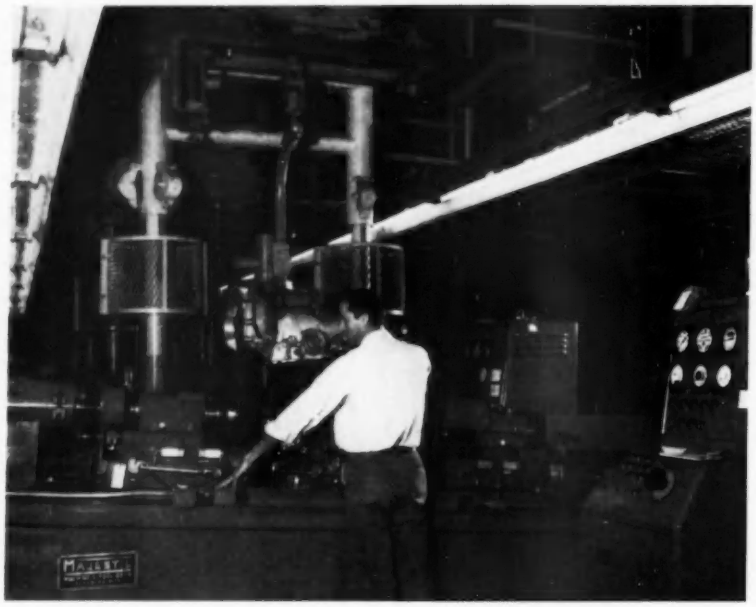
First operation is the finishmilling of the motor mounting face, holding this dimension 6.565-6.555 from the center line of the No. 3 locating hole. Besides finish boring three locating holes in the mounting face, Station 4 LH finish-bores two large bores, faces the front pump face and rear thrust face. Station 4 RH finishbores other diameters and faces additional surfaces. These operations are subject to critical tolerances as to surface finish, size, and flatness. For example, four of the surfaces are required to run true within 0.0005 in. per inch of radius. One of the bores is held 5.770-5.760 in.; another is held 2.3745-2.3730 in.

Station 9 handles automatic gaging of the locating holes and one bore at the left, and gaging of another bore at the right hand. Station 10 taps three holes, using a special tap to accommodate three Heli-Coil inserts. Station 14 finish-bores, chamfers, and faces the bore for the starter pocket. (*Cont'd*)

One of the control panels serving the Cross transfer machines. It reveals the utility of Westinghouse Cypak static control units in simplifying the electronic elements and wiring harness. Apart from trouble-free operation the Cypak system also goes far to reduce physical size of the control equipment.



Another example of how electronic controls simplify automated functions and facilitate scheduling as well as troubleshooting is shown here. This is the master control panel for the Mechanical Handling Systems power-and-free conveyor system installed in the transmission assembly area, final testing, button-up, rework and shipping. Here the dispatcher telephones one of numerous motor drive stations after a red light on panel signaled a break-down.



Transmission assemblies move on J-bar carriers on the power-and-free conveyor system out of assembly to the final test area. At this point the assembly is routed into one of the Majestic final testing machines which simulates actual operation in a vehicle.

At Station 17 the case is indexed 90 deg with motor mounting face leading to present the servo cavities for finishing operations, holding to rather close tolerances. Station 21 left and right hand sides handle automatic gaging of all bores. At Station 24 the case is rolled over with pan face up and mounting face leading to present the valve body pads in the pan face, these surfaces being finished with a fly cutter. The face is held to 4.586-4.591 in. from the center line of the case bore with flatness specified within 0.005 in. total indicator reading.

Following transfer machine stages, the case goes to a Majestic machine for pressure testing of the servo chambers. Then the three Heli-Coil inserts together with a thread plug and a cup plug are driven in place. This is done in a special Majestic transfer machine.

The transmission extension, an aluminum die casting about 18 in. long, is machined completely in a special 36-station Buhr transfer machine. In preparation for the Buhr cycle, two locating diameters —one at each end—are turned in a Sundstrand automatic lathe. In general, Buhr operations include drilling, reaming, chamfering, tapping; facing and boring of main bores; and boring the inserted bushing. Incidentally the Buhr machine is of walking bear type for automatic transfer from station to station.

Station 4 drills two flange holes, reams three flange holes, holding ream size 0.405-0.407 in. Station 6 has an automatic air gaging station for checking the previous operations. Stations 7 to 11 handle the finishing of the speedometer bore, while Station 12 has automatic gaging for this group, together with a probe for a tap-drilled hole. The part is rotated at Station 16 to present the mounting pad for hole drilling. The two holes are drilled and chamfered, then probed and tapped at a third station. The part is rotated again to present the work for pressing the bushing in place at the rear end. At Station 30 LH the bushing is finish-bored 1.688-1.687 in. while the bore in the front end is finished to 5.751-5.749 in. Both bores then are gaged automatically at the next station. The part is given a wash and at Station 34 enters a spinning fixture to facilitate the finish-facing of the large flange to length. This dimension is held 17.950-17.930 in.

The foregoing describes in very condensed form the sequence of operations required for the machining of transmission cases and the extension. It also covers the major installation of large transfer machines in this plant.

Several other installments are planned to cover the production of smaller components such as the planet gears, inner and outer races, and valve bodies. ■

• • •

Ford Will Spend $37 Million In Two Expansion Programs

Ford Motor Co. will spend $37 million in two plant expansion programs, including a $35 million modernization program, for steel-making in the Rouge area in Dearborn, Michigan.

The Rouge steel program is slated to get under way when current engineering plans are completed.

The second capital outlay, involving about $2 million, is for the Los Angeles Ford Div. assembly plant. The expansion will enable Ford to consolidate its Southern California assembly operations at Los Angeles after closing of the 30-year-old Long Beach plant, March 20.

The steel program will include a 75,000 sq ft building extension for the cold rolling mill, improved blast furnace stoves, renovated open hearth furnaces, new bank of four soaking pits in the hot rolling mill, new slab reheating furnace in the hot strip mill, additional annealing facilities, and new shipping and storage space.

According to Irving A. Duffy, vice-president—body group, Ford will continue to rely on outside suppliers for about half of its steel needs even after the multi-million dollar program is completed. Ford's 1959 ingot capacity is listed as 1,898,600 tons.

Ford has been working on the Los Angeles expansion for several months and expects to complete the program in April. Assembly capacity will be boosted from 35 to 50 cars an hour. Ford truck assembly will shift to the division's San Jose plant.

Details of the FORD GAS TURBINE

FORD Motor Company's new 300 hp gas turbine employs two stages of air compression and has dual burners. Known as the 704 it is said to attain maximum fuel economy in a range of 25 to 100 per cent of power. Weight of the new unit is 650 lb installed, complete with all accessories. The 704 is approximately 38 in. long, 29 in. wide and 28 in. high.

A wide variety of fuels can be used—unleaded gasoline, kerosene, jet engine fuel (JP4) or light Diesel fuel—and no warm-up-period is required.

Each compressor stage effects a four-to-one compression ratio. The first, or low speed, compressor operates at 46,500 rpm at an ambient air temperature of 100 F, the four-to-one compression ratio raises air temperature to approximately 450 F. At full engine power air flow is 2.7 lb per second.

The air next passes through an intercooler where its temperature is reduced to about 220 F. The intercooler is an integral part of the engine, employing a centrifugal type blower driven at 19,000 rpm, through a step-down-gear, from the shaft to the low speed compressor.

After cooling, the air passes to the high speed compressor and through another four-to-one compression stage which raises the temperature again, this time to about 625 F. The high speed spool operates at 91,500 rpm. Another 375 F temperature rise is attained as the air passes through the exhaust heat exchanger at roughly 1000 F.

Fuel is added and the mixture burns in the primary combustion chamber. At 1700 F the exhaust gas drives the high speed turbine that turns the high compressor spool. Supplying power to the turbine wheel reduces the temperature to about 1350 F.

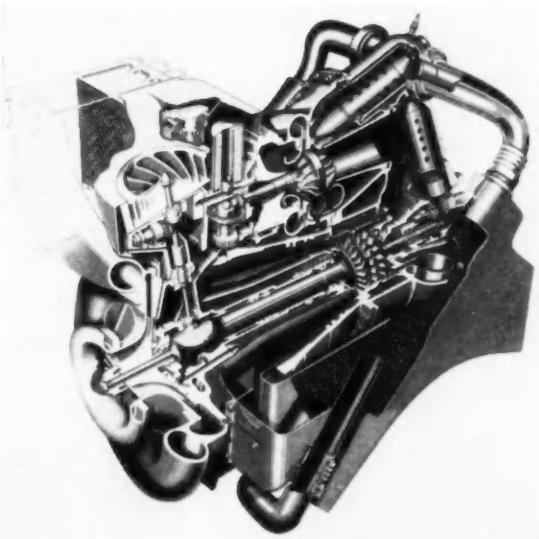
Additional fuel is added in the secondary combustion chamber to bring the temperature back up to 1700 F. From here the exhaust gases pass through the power turbine, driving it at a speed of 36,000 rpm, and through two turbine wheels that drive the low speed compressor.

Next the exhaust gases move to the heat exchanger where they release heat to the incoming air after the second compression stage. They are rejected into the atmosphere at about 1740 F.

The power turbine shaft, through a step-down gear arrangement, turns the drive shaft at 4600 rpm at full power.

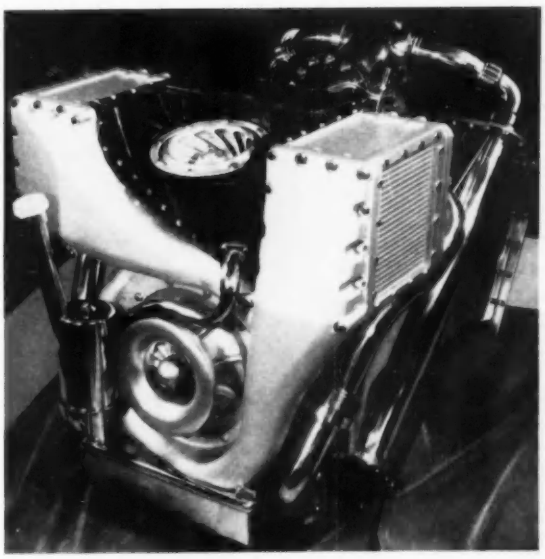
The engine is designed to burn 0.56 lb of fuel per brake horsepower hour at full power, 0.48 lb bhp hour at half power, and 0.58 lb bhp hour at one-quarter power.

Possible applications for the new power plant besides cars and trucks might include tanks, heavy duty tractors and bulldozers, half-tracks and off-road vehicles, auxiliary or stand-by power generating sets, starter carts for jet aircraft, earth movers or even small locomotives. Ford expects to be testing the new engines in vehicles before the end of the year. ■



Cutaway view of the new 704 supercharged automotive gas turbine showing the low pressure compressor and turbine drive assembly, lower center; intercooler fan, upper left foreground; intercooler, extreme upper left; high pressure compressor, turbine and accessory drive, upper center; primary and secondary combustion chambers, upper right; exhaust heat exchanger, lower right; and power output turbine, right center.

Ford Motor Company's new 300-hp gas turbine



Compact Cars Take Spotlight at International Automobile Show

By
Charles A. Weinert

Swedish-built Volvo 122S four-door sedan

Jaguar's newest luxury sedan, the Mark IX

Aston Martin DB4 equipped with a 263-hp engine

FOREIGN automobile makers, more than ever, are aggressively going after a big share of the American market. This fact was forcibly brought home by the record array, and expanded lines, of cars displayed at the Third International Automobile Show.

Some 60 different makes from eight overseas countries were in the exhibit held at New York's Coliseum, April 5-12. They came from England, France, Italy, Germany, The Netherlands, Japan, Sweden, and Czechoslovakia. The U. S. also was represented—by Chrysler and Imperial, Studebaker's Lark, and American Motors' Ramblers and Metropolitan. Also, in a sense, by Ford's English cars and German Taunus, GMC's Vauxhall and Opel, and Chrysler's Simca.

The sizes of the new foreign sedan models, several of which were displayed in this country for the first time, have edged up into the "compact car" class—as contrasted to the typical "small" European cars. It seems obvious they are aimed at not only competing with current U. S. offerings, but also directly with the anticipated Big Three's 1960 "compact car" entries (see AI, March 1, page 11).

Exterior lines, particularly of the new larger, popularly-priced sedans, are attractive and trend to-

ward American styling—including "moderate" rear fins. One-piece curved windshields and rear glass have generally been adopted. Interiors are more luxurious than customery European functional treatment in the past. Bumpers are more massive, and decorative trim and plating have been used to a greater degree—all for appealing to American tastes.

There are now some additional V-8 and six-cylinder engines being offered—supplementing the usual four-cylinder, or less, European practice. Automatic transmission options, insofar as the lower-priced popular models are concerned, are still few in number.

The foreign builders, as a whole, are offering an extremely large range of models—presumably to meet world-wide needs, and also to attract a wide cross-section of the American public. This can, however, be a disadvantage. There may be too many—both number of makes, and number of models in individual lines — for economical manufacture, distribution, sale and service.

The emphasis at the show was, of course, on economical operation —claims of 25 mpg and up. Also on lower first-cost (in the low $2,000 bracket; or less for the "small" cars)—although some of the new foreign entries are in the $3,000 and upwards price class.

Among the many new models displayed at the show were the following:

Fiat 1800

Fiat's latest model, the 1800, was shown in this country for the first time in the form of a five/six-passenger sedan. Wheelbase is 104-5/16 in., and overall length 175-25/32 in. Its new engine is an ohv six-cylinder, with a piston displacement of 125.34 cu in., rated 95 bhp. Compression ratio is 8.8 to 1. The transmission has four forward speeds, all synchronized. Front suspension is torsion bar type. Rear suspension has coil springs combined with quarter-elliptic leaf springs. The body is of unitized type construction.

Price of the new four-door sedan

Modern styling features Renault's Caravelle four-passenger 165-in. overall length, sports car

MAJOR SPECIFICATIONS OF POPULARLY-PRICED "COMPACT-CAR" SEDANS

Make and Model	Overall Lgth-in.	Overall Width-in.	Wheelbase in.	Engine No. Cyls.	Engine Cu In.	Max Bhp	Transmission No. Speeds	Approx. Wgt-lb
Rambler American	178.3	73.0	100.0	6	195.6	90	3*	2475
Studebaker Lark	175.0	71.4	108.5	6	169.6	90	3*	2600
Rambler-6	191.2	72.2	108.0	6	195.6	127	3*	2935
Austin A-55	178.0	63.5	99.2	4	90.9	53	4	2400
Borgward Isabella	172.8	67.1	102.3	4	91.0	66	4	2300
Citroen ID-19	189.0	70.5	123.0	4	116.5	66	4	—
Fiat 1800	175.8	63.8	104.3	6	125.3	95	4	—
Ford Consul	172.0	68.6	104.5	4	103.9	59	3	—
Ford Zephyr	178.5	68.9	107.0	6	155.8	86	3*	—
MG Magnette III	178.13	63.5	99.2	4	90.9	38½	4	2500
Opel Rekord	174.0	63.6	100.0	4	90.8	56	3	2000
Peugeot 403	176.0	66.0	105.0	4	89.6	65	4	—
Rover 90	178.25	65.6	111.0	6	161.0	93	4	—
Simca Vedette	187.0	69.7	106.0	8	143.5	84	3	2750
Singer Gazelle	163.5	60.8	96.0	4	91.2	60	4	—
Taunus (Ford)	172.2	65.7	102.5	4	103.6	67	3	—
Toyopet	171.9	66.8	99.6	4	88.7	65	3	2630
Vauxhall Victor	167.7	63.5	98.0	4	92.0	55	3	2200
Volvo 122S	175.2	63.8	102.4	4	97.0	85	4	2360

* Automatic transmission available.

Daimler of England has introduced this brand new sports car, the Dart

was indicated as being about $3200 p.o.e. New York. It will be followed later by a four-door station wagon of the same overall dimensions. The Fiat 1400 and 1900 four-cylinder models have been replaced by the 1800 and are no longer in production.

Renault Caravelle

The new Renault Caravelle was premiered at the show, with display of a two-door convertible model with a removable hard top. This latest Renault model has an overall length of 165 in.—10 in. longer than the Dauphine. Both individual front seats are adjustable, and the rear seat provides space for two passengers, for a total of four.

Two other models of the Caravelle will be made available, a coupe and convertible with a soft top, in addition to the model displayed. All three are scheduled for fall delivery in the U. S., and will be priced from about $2400 p.o.e. New York.

This maker also exhibited for the first time a high-performance version of the Renault Dauphine, known as the Dauphine Gordini. Its exterior appearance is the same as the standard Dauphine; and major changes consist of a modified engine with 20 per cent greater horsepower rating and a four-speed transmission in place of the usual three-speed unit.

Volvo 122S

Making its American debut at the show was the Swedish Volvo 122S, a four-door sedan with a wheelbase of 102.4 in. and an overall length of 175.2 in. Of unitized body construction, it has a weight of 2359 lb. The 122S is powered by a four-cylinder ohv engine of 97 cu in. displacement, having a compression ratio of 8.2 to 1, rated 85 bhp at 5500 rpm. Transmission is a four-speed forward, synchronized type. Suspension at front has coil springs and ball joints. At the rear, coil springs are also used, in combination with longitudinal torque arms.

Fiat 1800 sedan has an overall length of 175-25/32 in. and a new six-cylinder ohv engine

Simca Vedette

Chrysler's newest import, the Simca Vedette (AI, Feb. 15, page 40), made its first U. S. public showing. This model is a six-passenger, four-door sedan with a wheelbase of 106 in. and an overall length of 187 in. Its engine is an L-head V-8, with a piston displacement of 143.46 cu in., compression ratio of 7.5 to 1, and rating of 84 hp at 4800 rpm. Transmission is a three-speed forward type, with 2nd and 3rd synchronized. Front suspension has coil springs; rear, semi-elliptic leaf springs. Weight of the car is 2744 lb. Price $2298 p.o.e.

Also in this display was the new Ariane, a six-passenger, four-door sedan with the same 106-in. wheelbase, but equipped with an ohv four-cylinder, 48-hp engine. The Ariane, a less pretentious model, is also available with the 84-hp V-8 engine. Suggested p.o.e. retail prices have been given, respectively, as $1998 and $2098.

Austin A-55

British Motor Corp., Ltd., introduced the all-new Pinin Farina restyled Austin A-55 Cambridge (AI, Feb. 15, page 38.) It is a four-door sedan, priced at about $2200 p.o.e. New York.

The Cambridge is powered by the four-cylinder BMC "B" type ohv engine, now rated 53 hp at 4350 rpm and having a compression ratio of 8.3 to 1. Transmission is a four-speed forward type, with upper three speeds synchronized. Suspension is coil spring front, semi-elliptic leaf springs rear. The body is of unitized type construction.

MG Magnette, Mark III

Another new British Motor Corp. entry is the MG Magnette Mark III, four-door sedan (AI, March 1, page 11), also styled by Pinin Farina. It has a wheelbase of 99-3/16 in., and an overall length of 178-⅛ in. The body is of unitized type construction. Weight of the car is 2492 lb.

The engine of the Magnette is a "sports car tuned" MG ohv unit of four cylinders having a total piston displacement of 90.88 cu in. and a compression ratio of 8.3 to 1. It has twin carburetors, and is rated 66½ bhp at 5200 rpm. Transmission is a four-speed forward, mechanical type. Front suspension is coil spring; rear, semi-elliptic leaf springs.

Toyopet Crown Custom

Japan's newest four-door sedan, the Toyopet Crown Custom (AI, March 15, page 57), was presented as a contender in the U. S. family car market. It has a wheelbase of 99.6 in. and an overall length of 171.9 in. The engine is a four-cylinder ohv type, with a piston displacement of 88.67 cu in. and a compression ratio of 8 to 1, rated 65 bhp at 4500 rpm. Transmission

(*Turn to page* 68, *please*)

New Dip Transfer Welding Process

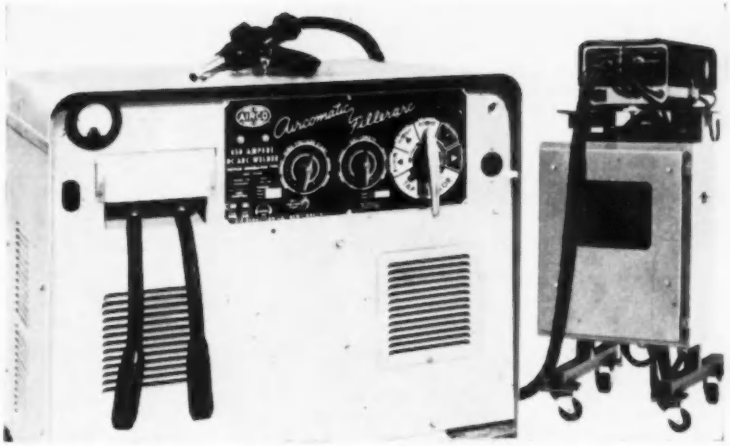


Fig. 1—Air Reduction Sales Co. gas-shielded metal-arc welding equipment

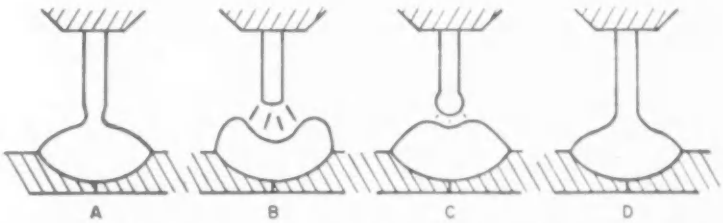


Fig. 2—Mechanism of metal transfer of the Dip Transfer welding process

THE Dip Transfer Process, developed by Air Reduction Sales Co., is a new and practical method of welding mild steel and low alloy steel in an atmosphere of inert gas.

With Dip Transfer, metal is transferred by a wiping action at the time of short circuit, rather than being projected through an arc stream as in conventional methods. The short circuits, caused by the electrode dipping into the weld pool, occur at a very steady rate, as high as 200 contacts per second. The result is a pulsing arc rather than an open, stable one.

The pulsing arc occurs with a relatively low arc voltage and only with a power supply having a value of inductance that will properly regulate the rise and decay of current.

When the moving electrode comes into contact with the pool, it creates a short circuit load on the power supply which causes the current to surge to a very high value. But before this surge reaches its maximum peak, overheating is caused by resistance to the flow of current at the point where the electrode enters the weld pool. Surface tension causes the metal to be wiped off the electrode (A, Figure 2) and shortly thereafter the contact is broken with an assist from electromagnetic pinch effect and a relatively high current arc is established. This sequence results in metal transfer without spatter.

The energy from this arc melts the electrode and keeps the weld pool fluid. It comes, in large, from energy stored in the electrical inductance during the interval of short circuiting. The dissipation of this energy is accomplished in an early stage by a transient arc voltage which is caused by the rapid breaking of an inductive power supply under static conditions. The arch develops considerable force which creates a depression in the weld pool (B, Figure 2).

As the energy from the inductor is discharged to the arc three things happen—the voltage and current decay, the forces on the weld pool decrease, and the melting electrode advances toward the work. Arc length therefore decreases (C, Figure 2). Finally, the electrode and the pool again come in contact (D, Figure 2), the liquid drop is transferred to the pool, and the cycle repeats itself.

Dip Transfer is particularly suited to welding sheet 0.253 in. and smaller. However, it is not confined to thin section. Heavier sections can be welded easily since deposition rates as high as six pounds per hour have been achieved in the vertical position using small diameter wires with the average currents approaching 200 amperes. It is especially effective in this type of vertical welding of heavy plate and also overhead welding. ■

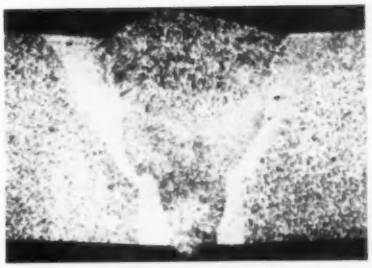
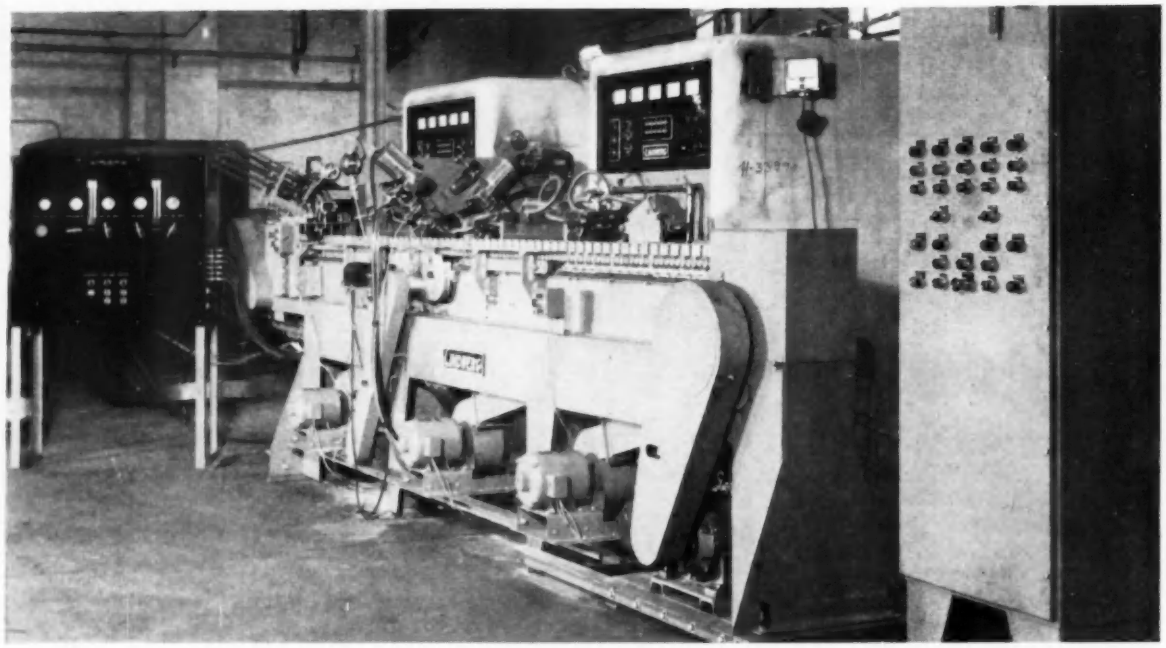


Fig. 3—View of a vertically positioned butt joint made in ½ in. steel using the Dip Transfer technique. (0.035 in. diameter electrode feeding at 210 in./-min; 110 amp; 18 volts; 80 percent argon, 20 per cent carbon dioxide shield)

Russia is again buying machine tools from Britain, Switzerland, and West Germany under relaxed trade regulations. Soviet spokesmen say the total volume isn't too big, and that the purchases are a "good will gesture."



Horizontal installation for automatic aluminizing of intake or exhaust valves at a rate up to 6000 units per hour. Steps in the process are as follows: 1) preheating the seat area by induction heating, 2) automatic aluminum spraying by the metallizing technique; and 3) final heating by induction to fuse and form the iron-aluminum compound at the interface (Lindberg Engineering Co.).

Latest Developments in Heat Treating for Automotive and Aircraft Fields

PART III

Selective Heating Ability, Cleanliness, and Ease of Working Conditions Among Many Advantages Offered to Industry by Induction Heating Process

INDUCTION heating has come a long way from its first melting application many years ago. Today, equipment of this type for heat treating, hardening, brazing, soldering, forging, forming, upsetting, shrink fitting, melting, etc., is installed in plants throughout the country. Due to its reliability, rapidity, and the high degree of selectivity of heating which can be achieved, induction heating is widely employed in the metalworking industries.

Simply stated, the induction heating process consists in placing the metallic part to be heated inside a coil through which an alternating electrical current flows. The magnetic field surrounding the coil passes through all or part of the piece being heated, and in doing so, generates an electric current in the part; this electric current heats the part.

Usually, relatively high frequency electric currents are used in order to facilitate transfer of energy from coil to part; such frequencies run from 1000 to 500,000 cycles per second. Frequencies of 1000 to 10,000 cps are obtained with motor-generator equipment. Higher frequencies are obtained by vacuum tube oscillators. In some cases commercial 60-cycle power can be used, principally in mass heating for forging, where the billets are three to five in. or larger in diameter.

GENERAL OPERATIONS

Induction heating is used extensively in automotive and aircraft manufacturing with the same gen-

By
Andrew W. Shearer

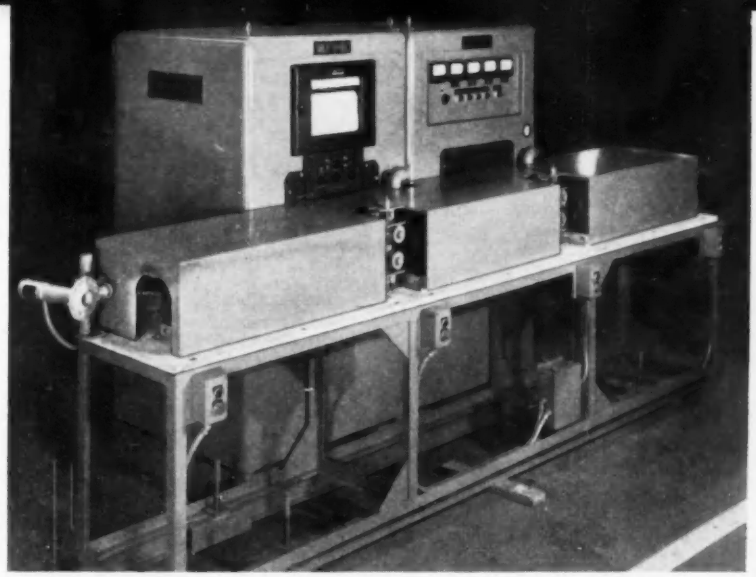
eral types of equipment employed in both industries. The fixturing and tooling are designed and built to suit the individual application and the production requirements of the parts to be treated. There are not, thus far, as many individual aircraft as there are automotive parts that require heat processing.

The induction heating equipment used in automotive plants is primarily of the motor-generator type which utilizes frequencies of 10,000 cycles and below. Much of it is designed for in-line production, where the induction heating is only part of a completely automated operation. There are still, however, a large number of applications which are hand-fed for low-volume production.

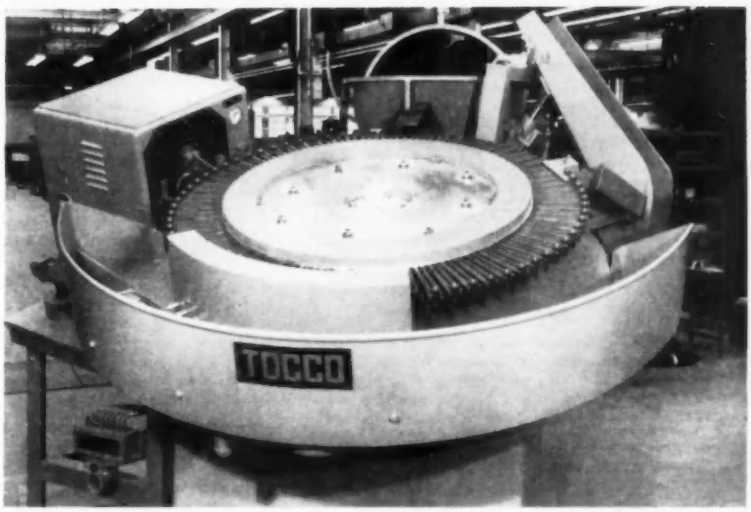
The use of induction heating in aircraft manufacturing is much smaller than in the automotive industry. The volume of production is lower, and there is, in general, not as much need for automation or a high rate of output. The requirement is for extremely precise control and much closer tolerances. Process controls which are accurate and produce the high quality required by the automotive industry are usually re-engineered for the extra quality demanded by the aircraft industry in such parts as jet engine blades and fuel manifolds; propeller bearings, hubs, cams, and valves.

Plant Installations

The automotive industry accounts *on the average* for an estimated 23 per cent of the total annual sales of induction heating equipment, while the aircraft industry buys at least two per cent of the total. These percentages, of course, represent the normal share of induction heating equipment sales that go to the two industries. They could be quite different in any given year, depending upon the expediture plans of



Continuous 250 kw, 10 kc bar heater is used to heat titanium and high-temperature alloy steels for shearing in the manufacture of jet engine blades. Radiation-type pyrometer at coil insures constant bar temperatures (Ajax Magnethermic Corp.).



High-production, automated unit for annealing threads on automotive ball studs at the Michigan Division of Thompson Products, Inc. Localized heating draws threads from 60 to 30 Rockwell C, using 50 kw at a frequency of 10,000 cps. The ball studs are put into a hopper, fed automatically and picked up by the fingers, carried through the inductor, and discharged into a chute leading to a conveyor which carries them to another operation (TOCCO Div., The Ohio Crankshaft Co.).

TABLE I

TYPICAL AUTOMOTIVE INDUCTION HEATING INSTALLATIONS

Manufacturer	Total	0-5 Yrs.	5-10 Yrs.	10 Yrs. & Older
Buick	36	21	5	10
Cadillac	24	18	6	0
Chrysler Corp. (a)				
American Motors Corp.	11	4	4	3
Company X (b)	181	97	27	57
Studebaker-Packard Corp.	7	0	0	7
Oldsmobile	75	23	0	52
TOTALS	334	163	42	129

(a) Included in furnace figures in Table I, Part I of article (no separate data provided).
(b) Permission not given for identification.

automotive and aircraft companies in relation to those of other industries.

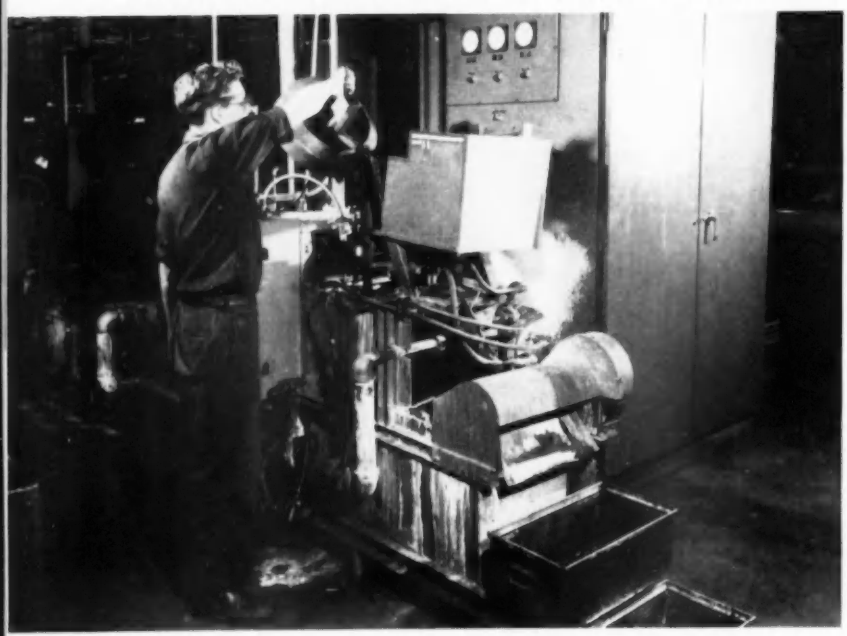
Table I shows the numbers of induction heating units installed in the plants of a representative cross-section of automotive manufacturers as of September, 1958 (approx.). Their ages in the ranges of 0 to 5, 5 to 10, and 10 and over years are also tabulated. Unfortunately, it was not possible, to compile a similar meaningful set of figures for aircraft plants.

It was pointed out in Parts I and II of this article (see AI, April 1 and April 15) that estimating the dollar value of heating equipments in any industry is a very difficult task. However, for purposes of this study, the *average* value of an induction heating unit in an automotive plant can be roughly calculated at $40,000. Since far less automation is generally used, the *average cost* figure for an aircraft plant installation would be much lower at around $12,000.

Small induction heater installed at Chevrolet Motor Div. of General Motors Corp. heats the ends of connecting rods for shrink fitting piston pins. Powered at 7.5 kw and 4200 cycles, it is capable of heating the ends to 400 F at the rate of 600 per hour. Installation consists of four units receiving power from a single generator and controls rated 30 kw. Power to each heating unit can be controlled for temperature and rate of production (Ajax Magnethermic Corp.).

The grand total of induction heating units owned by the automotive manufacturers listed in Table I is 334. If this figure is multiplied by the factor of $40,000 (estimated average cost), then this group alone has some $13.360 million invested in its induction heating equipment. There is every reason to expect the use of induction heating in the automotive industry to expand rapidly in the years ahead because of its ease of control, uniformity of repetitive results, and its high adaptability for in-line processing.

Pins for automatic transmission planetary gear assemblies are hardened by this 20-kw electronic induction heater at the Detroit Transmission Plant of General Motors Corp. The pins are scooped into the rotating pan by hand. They are then fed one by one into a magazine from which they drop through the heater coil and into a caustic bath (Industrial Heating Dept., General Electric Co.).



AREAS OF APPLICATION

Hardening and forging constitute the major fields of application where specially designed and built workhandling induction heating combinations are used. Small fixturing, soldering, brazing, annealing, or tempering jobs generally use simple static fixturing made for the parts concerned by the customer or by the induction heating supplier. Therefore, principal emphasis in the discussion of applications below will be given to these two major fields.

Hardening (Heat Treating)

Probably more induction heating equipment is used in the automotive industry for hardening than for any other single application. The inherent characteristics of the process can be used to full advantage in this area. Induction

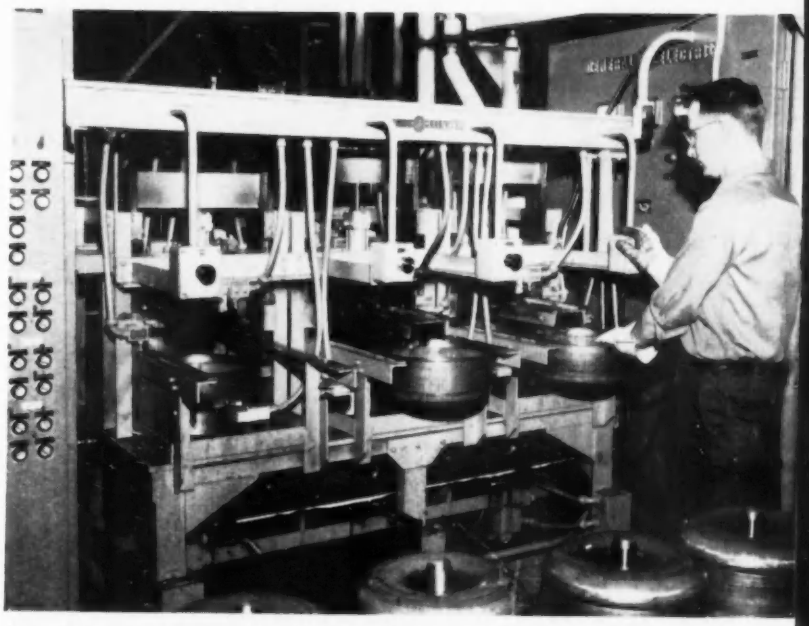
hardening frequently permits operations to be accomplished easily which would be difficult or uneconomic by any other means.

Parts can be locally hardened in a matter of seconds due to the rapid heat generation which, in turn, reduces the formation of scale. Such localized heating and hardening minimize distortion problems. Accurate control of the hardened area as to depth, width, location, and degree of hardness is provided. It also readily allows for different kinds of heat treatment on the same workpiece.

The following parts are typical of those being hardened on induction heating equipment in automotive plants today:

Crankshafts	Tractor Gears
Camshafts	Bearing Races
Rocker Arms, Shafts	Brake Cams
Piston Pins	Clutch Hubs
Output Shafts	Steering Knuckles
Pinion Gears	Transmission Gears
Differential Pinion Shafts	Axle Shafts
Oil Pump Gears	Trunnion Cups
Differential Planet Supports	Torsion Bars
Timing Sprockets	Valve Tips
Torus Cover Hubs	Valve Seats
	Cylinder Heads
	Starter Ring Gears

Aircraft parts hardened by induction heating would include engine components and propeller hubs. Also in the automotive heat treating category is annealing of worms, shafts, ball studs, and other parts.

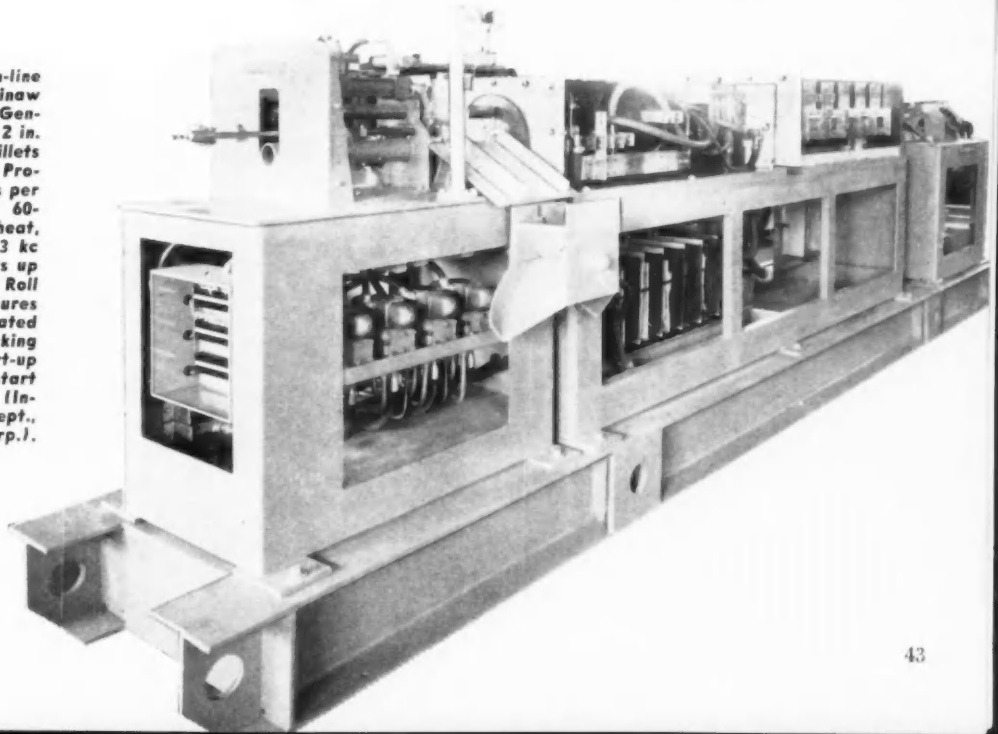


Converter pump housings for Buick Dynaflow transmissions are hardened by induction heat treating at the rate of one every six seconds in this three-station installation. The electronic induction heater, rated at 40 kw, operates at a frequency of 450 kc. The housings enter the loading end, progress by rollers to the opposite end, and are flipped over for hardening of the reverse side (Industrial Heating Dept., General Electric Co.).

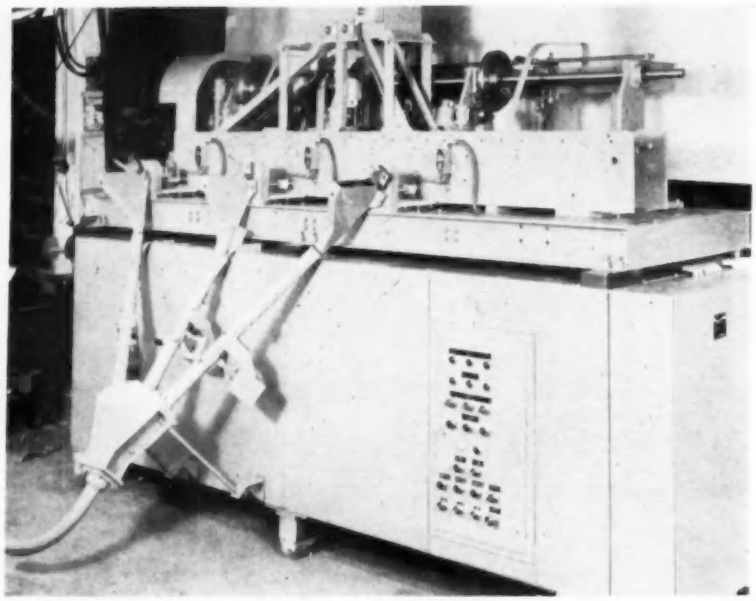
Forging (Forming)

The use of induction heating for automotive forging operations is expanding rapidly. Scale-free heating greatly reduces the wash-out of expensive dies and produces cleaner forgings which are easier and less costly to machine. In addition, the delivery of billets at regular controlled intervals to a forging machine or press which operates on an established cycle increases production.

Induction heating offers several other advantages particularly suit-



This dual frequency in-line forging machine at Saginaw Steering Gear Div. of General Motors Corp. heats 2 in. OD by 11 in. long steel billets to 2300F for forging. Production rate is 288 parts per hour using 340 kw of 60-cycle power for pre-heat, followed by 300 kw of 3 kc power to bring the parts up to final temperature. Roll feature on output end insures positive ejection of heated billet and eliminates sticking hold-ups. Automatic start-up of machine from cold start minimizes billet rejects (Industrial Electronics Dept., Westinghouse Electric Corp.).



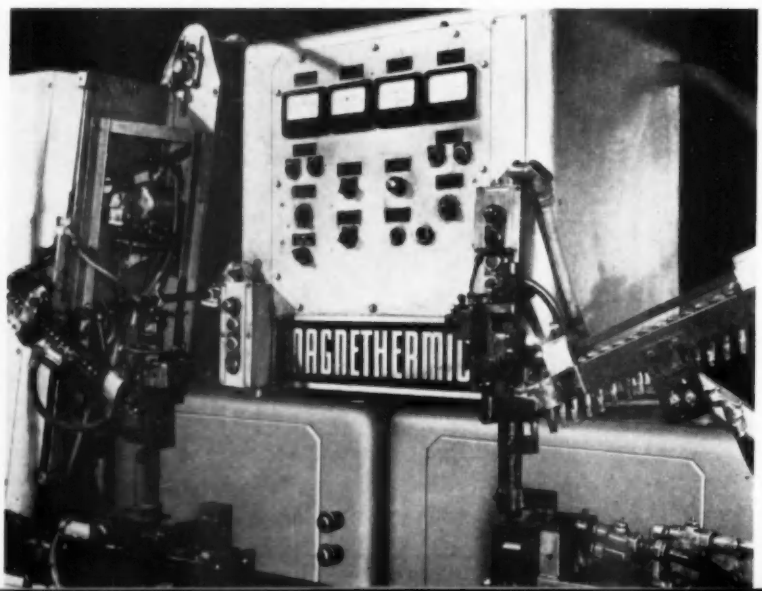
This 50 kw, 450 kc electronic induction heating station is used to heat ½-in. stainless steel bar stock (seven to nine in. long) to 2200 F for rough forging aircraft turbine blades at the rate of 2700 pieces per hour. Three separate heating stations are equipped with a magazine feed emptied automatically into common chute feeding the forge (Induction Heating Corp.).

able to forging operations. Start-up time is short, and standby delays are at a minimum. Accurate repetitive control of temperature gives heating uniformity. Working conditions are improved through the absence of noise, heat and fumes. Its adaptability to mechanization and speed of heating permit automatic inline processing to meet high production requirements.

Typical automotive parts on which the heating prior to forging is performed by induction would include differential ring gears, aluminum pistons, slugs or the ends of bars for forging idler arms, spiders, slip yokes, planet carriers, tie rods and valves.

In the aircraft industry, induction heating equipment is being used for forging and rolling jet blades. The advantages of short cycle, uniform heating have been well established in some of the expensive and highly reactive materials used in producing these parts. Bar heating equipment for shearing is showing substantial savings in producing billets for this work.

Completely automated induction heating unit with two heating stations. One hardens the top head of an upper suspension stud, and the other hardens the shank of a lower suspension stud for ball joint automobile suspension system. The stations work alternately heating and ejecting parts into an oil quench. Each is fed by an elevating conveyor hopper feeder which provides an eight-hour supply of parts (Ajax Magnethermic Corp.).



Melting

Induction melting is similar to other high-frequency induction heating operations, such as heating for forging, hardening, annealing, drawing, and brazing, except a means of holding and pouring molten metal is required; this is, of course, a furnace. The same high frequency power supplied by motor-generator sets for melting applications is used for the heating applications mentioned above; 60 and 180 cycle power is also used for induction melting and is of the static type of equipment that is non-rotating without moving parts.

One major advantage of induction melting is the fact that the same electrical energy that melts the metal also stirs it. Speed of melting is another advantage that conserves metal. Since energy is induced directly into the metal to be melted, energy losses are minimized, and melting rates are speeded.

Induction melting furnaces are used to greatest advantage in the melting of stainless steels, titanium, and other hard-to-control melts. They are used for melting, sintering, alloying, and for the study of behavior and characteristics of materials at high temperatures. A number of new superalloys are now being induction melted under vacuum for the high purity needed in aircraft jet engine applications.

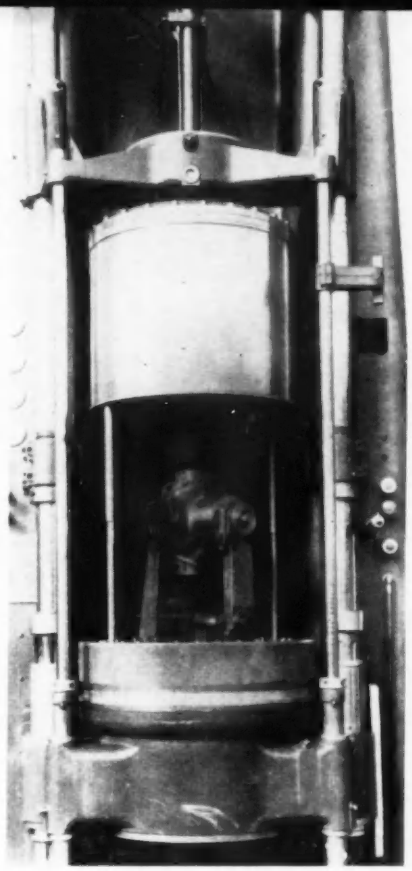
Brazing and Soldering

Induction brazing and soldering offer a fast, clean, and economical

processing method because of high output rates and excellent quality of products that can be obtained. Even more important is the freedom from distortion which can be achieved.

Such automotive parts as planetary output shafts for automatic transmissions, push rods, and valve tappet assemblies have been successfully induction brazed. The process is used extensively in the aircraft industry for brazing shrouds to tips of compressor blades for turbojet engines, piston rods, hydraulic cylinders, connecting rods and tubing, etc.

There is little basic difference in induction heating parts for soldering and the methods used for brazing, annealing, and hardening. Temperature requirements for soldering, however, are much less than those required for brazing. One typical application is the silver-soldering of drain flanges to automobile oil pans.



Aircraft propeller hub is shown in a position to be hardened. The inductor is moved progressively through the hub for the hardening. Enclosure shown above the hub is lowered at the same time to confine the quench (TOCCO Div., The Ohio Crankshaft Co.).

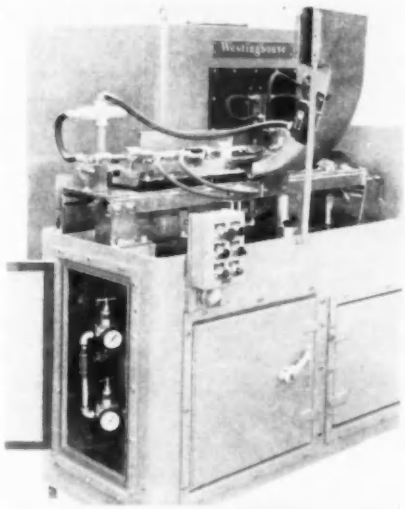
INDUCTION HEATING TRENDS

Any discussion of technological advances in induction heating is difficult without mentioning specific developments in the designs and applications of the equipment itself. The best way to describe these developments is to list those of recent vintage which are particularly significant and whose uses are being extended. In many cases, these innovations now permit the production of parts of a quality or type never produced before.

Automation

Induction heating equipment is becoming increasingly automated in production operations of volume proportions. Due to the small space it occupies and its lack of radiated heat, it is used more often in-line with existing cutting and forming equipment to provide a fully automatic or semi-automatic process. In particular, forging units are being tied in with conveyor infeed lines and out-feed lines directly to the press with minimum operator handling of the pieces.

Automatic start-up features are being included with in-line forging billet heaters to reduce the reject of billets on start-up and shutdown. Atmospheres are used in some cases to minimize scaling and rejects due to scaling. However, this is only where billets are of reasonable size, and the hold times are long. As a general rule, the short heating times and the tunnel atmosphere effect of the coils reduce scale in induction heating installations to a negligible value.



Automatic bearing race hardening machine at the Livonia, Mich., plant of Ford Motor Co. which case hardens the inside or outside of SAE-5060 bearing races to 0.100 in. case. Operating at a power level of 50 kw, 10 kc, it turns out 200 pieces per hour. Races are fed down a chute to a spindle, raised, rotated, heated, quenched, and discharged when lowered. On the discharge cycle, the next part is drawn from the chute into line with the spindle, ready for the next cycle (Industrial Electronics Dept., Westinghouse Electric Corp.).

Automatic induction heating unit at the Northville, Mich., plant of Ford Motor Co. which heats automotive valve onions to 2100 F for final forming operation at a rate of 1800 parts per hour; power level is 50 kw, 10 kc. High-production turntable operation fits into automated line. Input side is hopper with loading chute and positive device for putting parts into slots in turntable edge. After passing through "bonnet" heating coil, where onion ends are heated, parts are positively ejected into chute feeding upsetting operation. (Industrial Electronics Dept., Westinghouse Electric Corp.).

Quality Control

Control and safety features are becoming more refined on work-handling and basic generating equipment. These include the addition of temperature, flow, field overload, generator overload, pressure, etc., interlocks with panel

(*Turn to page* 71, *please*)

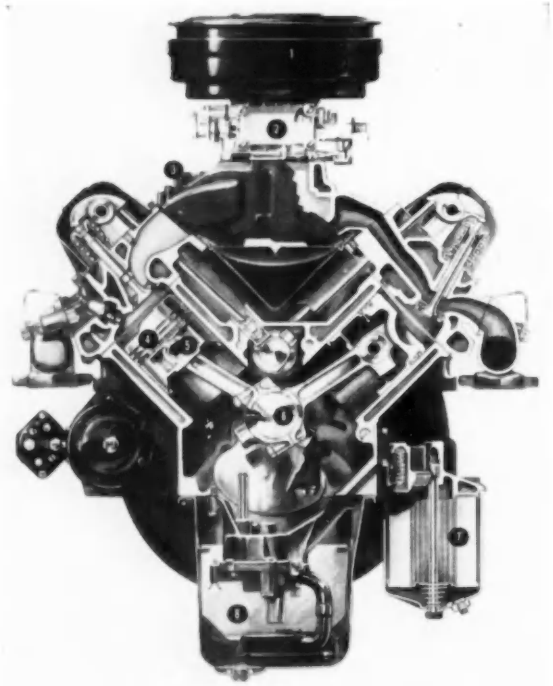
International Harvester's New Engine

Included in the International B-line of trucks is the new B-110 pickup, rated 4200 to 5800-lb GVW. Standard engine is a six-cylinder unit rated at 141 hp. Optional equipment comprises a new 154.8-hp V-8 engine, as well as automatic transmission, power brakes, power steering, and four wheel drive.

LAST month International Harvester Co. launched a new line of light-, medium-, and heavy-duty trucks in the 4200 to 33,000-lb GVW range—known as the B-line. Featured are improved styling, added power options in the form of three new ohv V-8 engines, and a new pickup body design. (See AI, April 15, page 24.)

Nine six-cylinder ohv engines, with horsepower ratings from 113 to 154, are being offered. Five are gasoline models and four equipped with factory-installed LP-gas fuel systems. Three new V-8 engines are available as optional equipment throughout the B-line.

One of the major design features of the V-8 engines is the configuration of the combustion chamber. The thick-dome piston has a concave section in its head which in combination with a somewhat similar depression in the cylinder head forms a swirl or high-turbulence chamber. At the same time, a quench area is provided on the side of the combustion chamber away from the spark plug. This combustion chamber configuration is said to allow the use of regular gasolines in these engines—which have compression ratios ranging from 8.05 to 8.4 to 1—without "ping." On the V-304 and V-345, steel inserts are employed in the top ring grooves to lengthen piston life.



The configuration of the combustion chamber, use of hydraulic valve lifters, and other design details of International's new series of three V-8 truck engines are shown in this transverse cutaway.

The valve train includes hydraulic valve lifters supplied with oil by metered passages through the rear cam bearing. There are nine supports for the rocker-arm shaft, as well as five bearings for the camshaft.

Exhaust valves and seats are faced with a special heat-resistant alloy. In addition, the exhaust valves are widely separated from each other, alternating in position with intake valves, to further improve cooling. The latter are equipped with an "O"-ring seal for control of valve stem lubrication and prevention of oil seepage. Full valve rotation is provided.

The carburetor is of two-barrel, downdraft type, fitted with an oil bath air cleaner. ■

Condensed Mechanical Specifications
IHC B-Line V-8 Engines
(OHV type)

Model	V-266	V-304	V-345
Bore (in.)	3 5/8	3 7/8	3 7/8
Stroke (in.)	3 7/32	3 7/32	3 21/32
Displacement (cu in.)	266	304	345
Compression Ratio	8.4 to 1	8.2 to 1	8 to 1
Bhp (max.) at rpm	154.8 @ 4400	193 @ 4400	196.7 @ 4000
Torque (lb ft) max. at rpm	227 @ 2800	282.5 @ 2800	309 @ 2400
Governed Speed (rpm)	4000	3900	3800

The three models in M-M's new Star series tractors. Left to right are the Four-Star Super, the Four-Star, and the Jet Star.

Report from the FARM EQUIPMENT INDUSTRY

By Kenneth Rose

I-H Produces Its Largest Wheel Tractor

International Harvester Co. is now in production on its largest wheel tractor — the International 660. The new six-bottom plow model is the seventh basic power size farm tractor in Harvester's line. The six-cylinder engine produces 75 hp at the belt and 68 at the drawbar. The tractor is available with gasoline, LP gas, or Diesel engines. With the optional Torque Amplifier drive, it has 10 forward speeds ranging from 1.79 to 16.11 mph. The valve-in-head engine has a governed speed range to 1800 rpm.

Another new Harvester unit is the McCormick No. 50 heavy duty power loader, for use on the International 300, 350, and 460 tractors equipped with at least two-valve Hydra - Touch hydraulics. Two double-acting cylinders on the booms are powered by the tractor's hydraulic system. The No. 50 loader is equipped with a 60-inch fork, and by use of a tine cover this can be converted into a ½-cu yd, 60-in. wide material bucket. In addition, the fork can be replaced by either of two regular material buckets, one of ⅓ cu yd capacity, the other of ½ cu yd size. Rated capacity of 1900 lb can be lifted to the full dumping height of 9 ft 2 in.

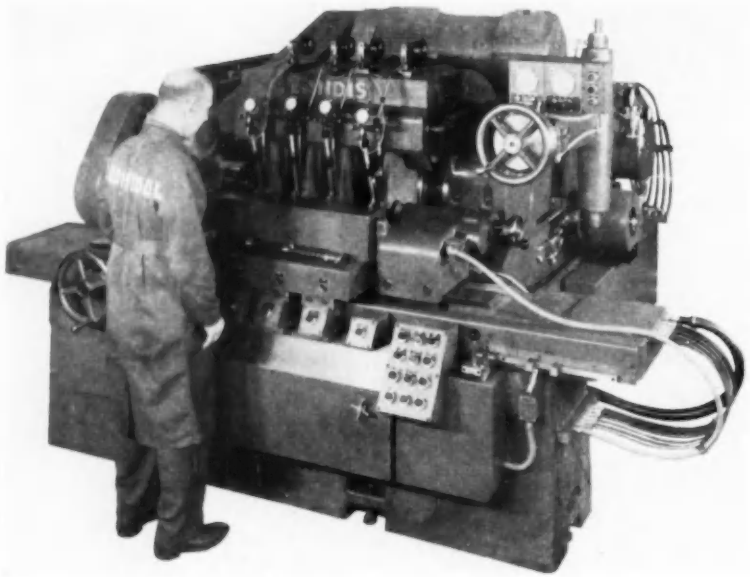
M-M Four-Star Tractors

Minneapolis-Moline Co. has announced a new series of tractors, all of 48 hp plus at the belt, and 44 hp plus at the drawbar. The series of three vehicles starts with the Jet Star, a general purpose farm tractor with adjustable front and rear wheel tread, reversible front axle to permit shortening the wheelbase, double disk brakes, and speed range of 1.89 to 15.4 mph forward and 2.9 to 4.2 mph in reverse. A 10-speed Ampli-Torc is optional. With the same basic features, but having a grille with recessed headlights, chrome trim, and with the Ampli-Torc as standard equipment, is the Four Star model. In high range, speeds are from 2.2 to 17.8 mph, and 1.2 to 9.3 mph in low range. Power steering and the Tel-O-Flo hydraulic system are also standard on this model. The Four-Star Super is a deluxe model with the features of the Four-Star and with power adjusted rear wheels, four headlamps, combination tail and floodlights, independent power takeoff, crown fenders, and tilt-back seat in addition. The Super has three interchangeable front end wheel assemblies, wide adjustable, single wheel, and dual wheel. There is a deluxe instrument panel. ■

Largest of International Harvester's wheel tractors, this machine will handle a six-bottom plow or multiple hitches of other equipment.

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card at back of issue



Landis Type IWR multiple wheel precision cylindrical grinding machine

Multiple Wheel Precision Cylindrical Grinder

THIS Landis Type IWR multiple wheel grinding machine will grind two or more concentric diameters to close tolerances on a production basis. It is available for complete or semi-automatic operation and is made in 10 and 14 in. swings with 30 in. between centers.

Wheel diameters are 36 in. On the 14 in. swing machine, either 36 or 42 in. wheels are available. Parts such as crankshaft and camshaft line bearings, transmission shafts and components of jet engines are ground on these machines to precision limits. Diameters can be straight or profiled. All hydraulic controls are mounted on a panel away from the bed; hydraulic oil and coolant reservoirs are in separate tanks outside the bed. *Landis Tool Co.*

Circle 30 on postcard for more data

Machine Control Unit

ABENDIX machine control unit has been designed for switchable simultaneous continuous control of 3 out of 4 motions of rigid, high accuracy 4-axis milling machines.

The unit provides the normal 3 axis of control (longitudinal, transverse and vertical) standard to any milling machine, with the additional feature of being able to switch from a linear motion to a rotary table or tilting spindle. This feature facilitates the numerical machining of complex shapes such as turbine parts, cams, aircraft and missile bulkheads.

Command pulse values from the control unit to the machine tool of from 0.0002 in. to 0.000025 in. can be achieved with this system.

The input to the control unit is punched tape. The high speed tape reader on the machine control unit permits tape reading of 300 lines per second in the forward direction and 600 lines per second in the reverse direction.

The circuits of the machine control are almost exclusively digital in nature. The digital system is of the dc level type, using vacuum tube flip flops and germanium diode gate circuits. The circuits are mounted in plug-in packages and printed circuit wiring is used within the packages. *Bendix Industrial Controls Section, Bendix Aviation Corp.*

Circle 31 on postcard for more data

Depth-Indicating Device

THIS visual depth micrometer, called the Besly Readepth, can be used to check the depth of holes, slots, keyways, etc. It has a large easy-to-read dial and can readily set to changed dimensions. It is accurately reset with the masters supplied, therefore, no jo-blocks or other masters are required. Constant accuracy from 0 to 3 in. is assured because resetting is required only when the contact rods are changed. *Besly-Welles Corp.*

Besly Readepth for checking depths

Circle 32 on postcard for more data

Cup-Type Spray Gun

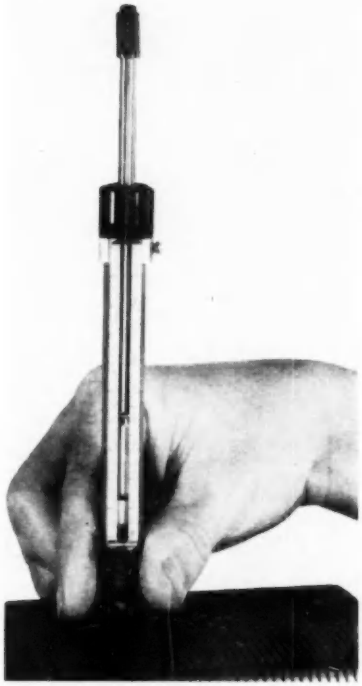
A LIGHTWEIGHT cup gun for spraying paints, enamels, lacquers, etc., features a two piece, aluminum alloy body with a built-in air distributor for even air distribution and better pattern. No gaskets are required in the tip or cap assembly—eliminating chance for leaking and simplifying cleaning.

All fluid tips, as well as male threads, are stainless steel to reduce wear and give long life. The one piece drawn aluminum paint cup has a fast-acting spider lock and cover supported yoke clamp that holds the cup without straining the lock pins. *Gray Co., Inc.*

Circle 33 on postcard for more data

Portable Hardness Tester

THE Sklero hardness tester can be carried in a shirt pocket and enables the user to make on-the-spot hardness readings without moving the test piece to large stationary test equipment. Operating on the rebound



Sklero portable hardness tester

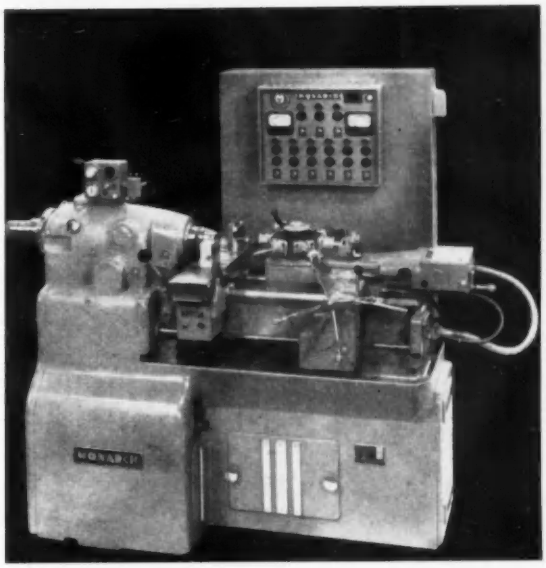
principle, the tester provides readings to within plus or minus of 1-point Rockwell C. Test readings can be converted to Rockwell Shore, or Brinnel by the conversion table provided. *Precise Products Corp.*

Circle 34 on postcard for more data

Precision Hand Screw Machine

Pictured is the Speedi-Matic, an improved Monarch hand screw machine for lots ranging from less than 25 to more than 2500 pieces. It has electronically operated speed controls and a hydraulically powered turret. The control center provides preselected, automatic speed and feed change. The self-centering cut-off and forming slide moves on preloaded antifriction bearings and carries its own forced feed lubrication system. Bar stock capacity is 7/8 in. (Monarch Machine Tool Co.)

Circle 35 on postcard for more data



Centerless Belt Grinder

DESIGNED for heavy-duty precision grinding and finishing of rod or tube stock, the Engelberg Model #8132-HD features a large workpiece capacity, a powered outboard support package, and an automatic reverse feed mechanism. It will handle stock from 1 to 9 in. in diameter, and up to any length. Average through-feed rates at a four degree helix angle setting of the regulating wheel and power feed stands vary from 2½ to 20 fpm.

Abrasive belt size is 8 by 132 in., with belt speed of 4500 sfpm. The machine is equipped with air-belt tensioning, a 50 hp belt drive unit with all electric controls, and a complete recirculating system of 200 gallon capacity with ½ hp coolant pump. Regulating wheel is 13 in. in diameter, 8 in. wide. *Engelberg, Inc.*

Circle 36 on postcard for more data

Gear Tooth Honing Head

A METHOD that will enable manufacturers of spur and helical gears in the 12 to 200 in. diameter ranges to economically apply the gear tooth honing process has been developed by *National Broach & Machine Co.*

The method makes use of separate tool heads and feeding mechanisms that enable one large rotary machine to perform both the gear tooth shaving and the gear tooth honing operations.

Circle 37 on postcard for more data

Ratchet Wrench

WEDGE action of a 12-tooth pawl engaging a 60-tooth gear is the principle of a New Britain ratchet design. Important features are light weight, small head, and short swing that speeds up work in close areas. The assembly has a friction-free seal to keep dirt out and lubricant in. All popular drives are available. *The New Britain Machine Co.*

Circle 38 on postcard for more data

Electronic Gage

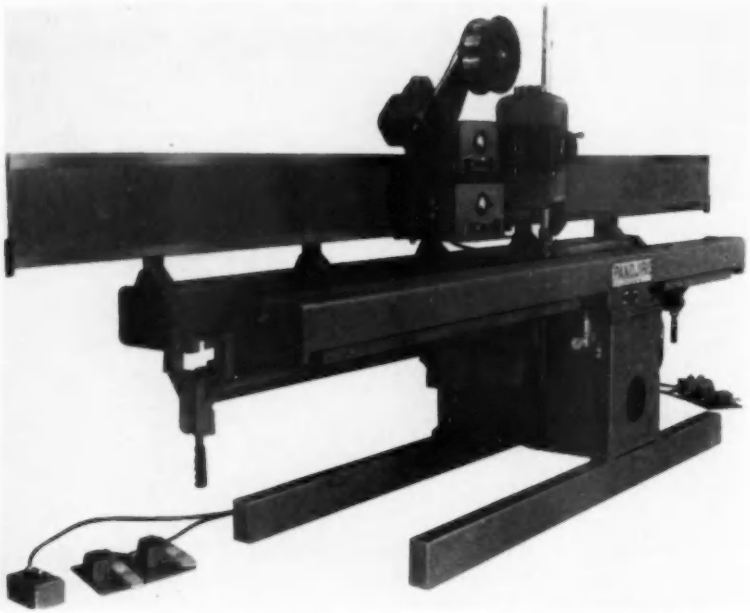
DEVIATIONS as small as ten-millionths of an inch in the curvature or contour of inner and outer bearing races can be detected by the Accutron Electronic Gage developed by the *Sheffield Corp.*

The instrument can be used also to inspect the radius of other types of precision parts.

Equipped with standard components, the gage checks race curvature of inner and outer bearing rings from ⅜ to 6 in. outside diameter, ball size from 1/16 to ⅝ in. diameter.

Circle 39 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT



Pandjiris opposed double mandreled seamer with holding and clamping mandrels

Double Mandreled Seamer for Maximum Production

TWIN mandrel weld seaming fixture to achieve continuous arc time, maximum production, and operational utility of one automatic welding head and power source is available through a line of opposed double mandreled seamers with both holding and clamping mandrels utilizing the same welding head.

While the welding cycle is taking place on one side of the fixture, the next piece to be welded is being loaded in the opposite side, thereby eliminating production loss due to normal down time for loading and unloading. And by continuing the weld to the next piece to be welded, with loading and unloading taking place during the welding cycle on the opposite hand of the fixture. *Pandjiris Weldment Co.*

Circle 40 on postcard for more data

Precision Boring Machine

A SPECIAL double-ended precision boring machine that accommodates eight machining variables in 16 different transmission cases has been designed by *Snyder Corp.* The electrically-controlled, hydraulically-operated machine bores two holes in each end of transmission cases ranging in length from 12⅞ in. to 21⅜ in. The variables that the machine is designed to accommodate, in addition to length, include variations in sizes of all four holes, variation in depth of two holes, variation in center distance of the holes and variations in spindle speeds required for both cast iron and aluminum cases. Cases can be precision-bored on the machine at rates of from 22 to 55 pieces per hour, depending on part length. The machine is approximately 14 ft long and 6 ft high. Hydraulic power is provided by a separate power pack unit. Once a setup has been made for a particular part, pushbuttons control the operating cycle for maximum efficiency.

Circle 41 on postcard for more data

Portable X-Ray Unit

A 50 LB industrial X-ray generator small enough to pass through a six inch opening but powerful enough to radiograph 1¼ in. of steel in 45 seconds has been designed.

The Andrex 140 KV X-Ray Unit, designed for inspections by one man of pressure vessels, castings, aircraft, missiles, etc., detects inner flaws in the metal.

The unit consists of two parts—the 50 lb generator and the 55 lb control. Meters and stepless controls permit constant monitoring during each exposure to prevent the necessity of retakes due to line voltage fluctuations or other variable factors. Both generator and control are sealed to permit uninterrupted use. *Picker X-Ray Corp.*

Circle 42 on postcard for more data

Dry-Type Power Centers

DRY-TYPE power centers from *Westinghouse Electric Corp.* feature low sound levels and type RM lightning arresters. Sound levels of the units range from four to nearly ten decibels below NEMA standards, with the greatest reduction in the larger units.

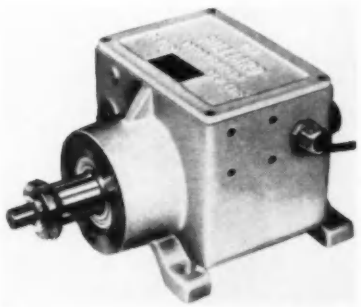
These power centers are primarily used to reduce voltage in industrial plants for lighting and machine tool circuits.

Circle 43 on postcard for more data

Intermittent Drive Unit

CALLED the I. D. U. (Intermittent Drive Unit), this machine provides precise intermittent motion from a constant source of rotary power. All parts are totally enclosed in an oil bath housing making the unit suitable for dusty, steamed or "washed-down" conditions.

It can be installed as easily as a motor and needs only electrical connection. With an I. D. U., hand or foot operated equipment can be mechanized, existing power operated machines can be automated and it can be used as a building block in designing

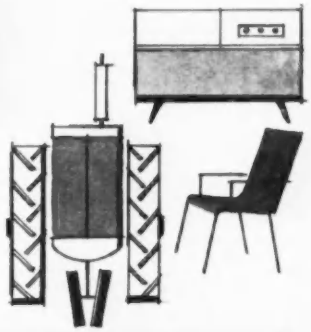


Hilliard intermittent drive unit gives precise control of any intermittent motions desired—clip and bend, shear or slash, oscillate or repeat, raise or lower, index and position.

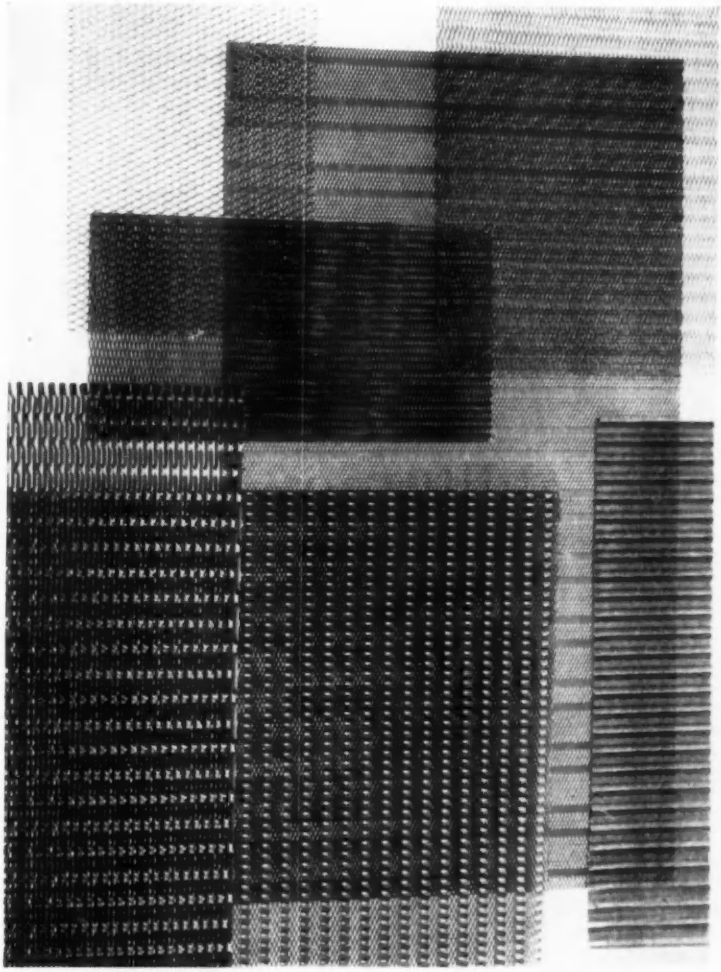
new machinery or production drives. It features flexible control, manual, mechanical or electrical, permitting "demand type" operations in fixed or variable cycles. *Hilliard Corp.*

Circle 44 on postcard for more data

Inland "job-tailored"
Cold Rolled Sheets work better



product: EXPANDED METAL



problem:

the production of expanded metal panels for a wide variety of products ranging from automobiles to air conditioners, tractors to phonographs, stoves to patio furniture, television receivers and lawn mowers. These to be fabricated from decorator designs in an almost limitless range of complexity. Equipment, created specifically for the purpose, functions at highest efficiency and economy with coil steel which is cut and expanded. The often enormous stretch of quite narrow strands could cause breakage and rejection of the entire piece.

solution:

the problem presented was overcome by "job-tailored" Inland Drawing Quality Aluminum-Killed Steel. The steel not only took punishment of severe expansion and pattern formation, but provided an excellent surface for all subsequent finishing operations.

INLAND STEEL

30 West Monroe Street, Chicago 3, Illinois

Sales Offices: Chicago · Davenport · Detroit · Houston · Indianapolis
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INLAND

Cold Rolled Sheets

Circle 122 on Inquiry Card, for more data

News of the MACHINERY INDUSTRIES

Makers of British Machine Tools Will Display Wares in Production Show at Toronto on May 4-9 that Will Include Boring Machines with Automatic-Positioning Controls

By Charles A. Weinert

British Makers In Canadian Show

British machine tool companies will participate in the National Industrial Production Show, which is to be held in Toronto, Canada, May 4-9. Two of these makers, at least, will show machines with automatic-positioning controls, according to pre-show reports.

H. W. Kearns & Co., Ltd., of Broadheath, Manchester, England, will exhibit a huge horizontal boring machine which can handle workpieces up to about five tons in weight. It is more specifically described as a No. 3 Kearns universal surfacing, boring, milling, drilling, tapping and screw-cutting machine. This unit is fitted with a British Thomson-Houston electronic two-dimensional automatic-setting system, which includes depth control.

The Newell Engineering Co., Ltd., of Peterborough, England, will display its new Spacematic 2436 jig boring and milling machine. This machine has a roller measuring system which permits manual setting to 0.0001 in., and a separate automatic-positioning system developed to reduce production time when a slightly lower accuracy of 0.0005 in. is adequate. The two systems can be used in conjunction with each other in cases, for instance, where the workpiece has a few holes which are extremely critical on spacing and remainder not quite so critical.

In passing, it may also be of interest to note that another maker —Muller & Co., Ltd., Cleobury Mortimer, Kidderminster, Worcs. —will exhibit drills ranging from 0.0016 in. up to 0.2 in. diam, with two standardized shank sizes of 1.0 and 1.5 mm.

Around the Industry

Landis Tool Co.—Ralph E. Price has been elected executive vice-president and assistant general manager; E. R. Fogt elected assistant treasurer; D. H. Ruth named sales promotion and advertising manager; and W. P. Flohr appointed chief engineer.

Motch & Merryweather Machinery Co.—has entered into a manufacturing agreement with Heller Brothers of Neurtingen, Germany.

National Machine Tool Builders' Association — the annual sales training conference for representatives of member companies of NMTBA and the American Machine Tool Distributors' Association is scheduled for the week of July 27 at Cornell University, Ithaca, N. Y.

General Electric Co. — recently sponsored, through its Metallurgical Products Department, a regional seminar to bring manufacturers up to date on developments in cemented oxide cutting tools. The seminar, held in Detroit, Mich., on March 31-April 1, was attended by representatives of 14 machine tool makers from Ohio and New York State. Similar seminars are planned for other regions.

Kearney & Trecker Corp.—has established a Contract Div. to handle various types of sub-contract work, such as special-purpose machinery (non-machine tool); specialties for aircraft, missile and automotive production; and general-purpose parts production. E. H. Behrens has been named sales manager, and J. P. Bunce named manufacturing manager of the new division, which will be headquartered at Milwaukee, Wis.

Grinding Wheel Institute—has published an up-dated edition of "The Grinding Wheel," a textbook of 32 chapters and 532 pages which discusses the many phases of grinding operations. While based on the prior 1951 edition, the revised version contains more than 100 pages of new material. Four new chapters have been written on mounted wheels, reinforced wheels, automation, and safety. New subjects also incorporated include jig grinding, electro-assist grinding, and optical projection grinding, as well as automatic sizing, loading and unloading. Price of the book is $4.95, and it is available from the Institute at 2130 Keith Bldg., Cleveland 15, Ohio.

American Society of Tool Engineers—has announced the completion of a 275-page research report on the present applications and theories of metal-cutting. Published in book form and entitled "An Evaluation of the Present Understanding of Metal-Cutting," it represents an evaluation and condensation of more than 12,000 world writings on the subject. Chip formation, cutting temperatures, tool life, cutting fluids, and machinability are major topics. Copies of the book are available from the ASTE Research Fund, 10700 Puritan Ave., Detroit 38, Mich., at $5.00 (members) or $7.50 (non-members). ■

AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED

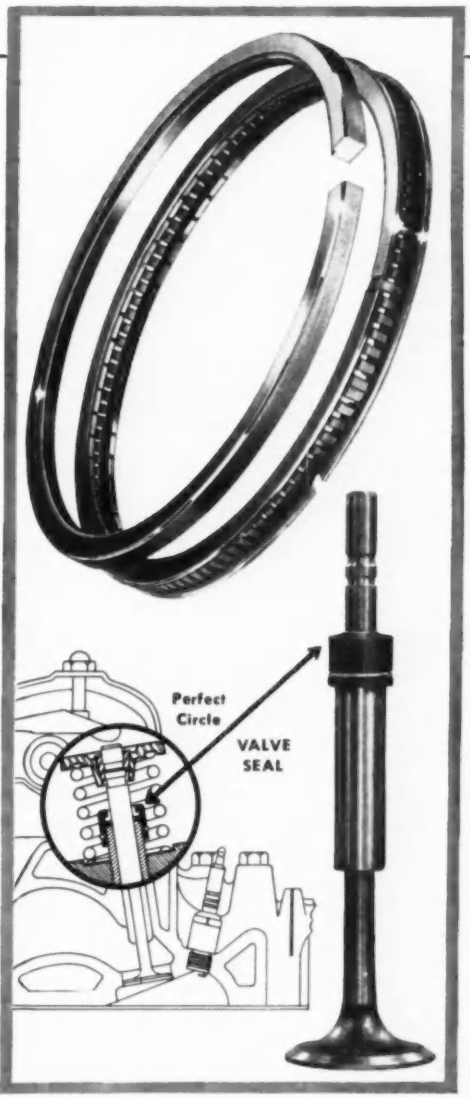
2 reasons why engines get more power protection from Perfect Circle

1. PERFECT CIRCLE CHROME RINGS

solve problem of excessive oil consumption past pistons!

P C chrome piston rings are the finest obtainable! Top rings and oil rings are plated with thick, solid chrome. Entire area of ring travel gets complete wear protection, more than doubling life of cylinders, rings, pistons. No tedious break-in is necessary because rings are pre-seated at factory.

SPECIFY P C CHROME RINGS for thousands of extra miles of power protection with positive oil control!



2. PERFECT CIRCLE VALVE SEALS

solve problem of excessive oil consumption past valves!

New overhead valve engines develop higher compression pressures...and higher deceleration vacuum. Increased vacuum draws oil through loose or worn valve guides. Avoid this oil loss with new Perfect Circle Valve Seals!

SPECIFY PERFECT CIRCLE VALVE SEALS to control oil loss through valve guides in overhead valve engines.

PERFECT CIRCLE

PISTON RINGS AND POWER SERVICE PRODUCTS

Hagerstown, Indiana — **Don Mills, Ontario, Canada**

Circle 123 on Inquiry Card, for more Data

METALS

Highest Shipments of Steel on Record Are Due Partly to Build-Up of Inventories. Demand for Aluminum Increasing

By William F. Boericke

Consumers Rush To Strengthen Steel Inventories

With the almost virtual certainty of a steel strike in July steel consumers have become vitally concerned with building up adequate inventories to protect themselves during a shutdown period. A big part of the hectic buying that has characterized the recent month must be credited to this source and not to actual consumption. One trade authority estimates about two tons out of every nine tons purchased has gone into inventories and true overall consumption is no more than 70 per cent of the 93-94 per cent operating rate.

There is no doubt that inventories have been built up vigorously by all except those few diehard users who think a steel strike will not materialize. When the year started steel inventories were estimated about 13 million tons. Upwards of 8½ million tons will have been added to stocks by the end of June. This would make about 22 million tons in reserve to draw on, or enough for 60 to 90 days supply.

In the unlikely event of a postponed strike or one of short duration the operating rate at the steel mills is likely to plummet as consumers endeavor to work off their excess inventories and reduce carrying costs which add substantially to the cost of steel. Normally there is no need to carry a 60 day inventory of steel with 147 million tons of ingot capacity and annual consumption estimated at no more than 110 million tons this year.

Record Output in April

April will probably prove to have been the most active month in steel history. The first half of the month showed weekly shipments of 2,661,000 tons of raw steel, the highest on record. Nevertheless the rush of new orders has slowed down as consumers have realized the steel plants are booked solid until July for most products. There are some exceptions. While flat rolled steel is at a premium with late comers obliged to look abroad for supplies, the mills could take more orders for structurals and oil country goods, and railroad orders, while improving still leave something to be desired. But on an overall basis the industry is going strong with no cancellations in sight and it is expected shipments will continue heavy right up to June 30. Warehouses are full and outside storage is sought. Transportation facilities are being strained. Most stainless steel producers are working at capacity to supply Detroit and appliance manufacturers.

Steel Scrap Demand Stagnant

There is no visible improvement in the paradoxical situation in the steel scrap market which has continued to exhibit extreme softness. Veteran scrap dealers declare it is completely without precedent, that when the operating rate of the industry edges toward capacity there should be so feeble demand for scrap. For decades scrap prices have been considered a fair barometer for steel demand but they have signally failed to do so in the present steel boom. Prices have fallen as the production rate climbed for raw steel. The most reasonable explanation for this strange phenomenon is that the 1959 recovery started after a recession year when the yards were already well stocked with scrap so there was less need for the mills to buy scrap in the market. Whatever the reason scrap dealers are an unhappy lot.

Aluminum Demand Improves

Demand for aluminum is increasing, but at no breakneck speed. It appears that an eight per cent increase will be seen this year over 1958. Nevertheless shipments will be still far below capacity of the six primary producing companies. Some of the present demand may be due to inventory buying in anticipation of a strike in August but to date this is of small proportions. There is just too much metal in stock with the producers to give consumers much cause for worry.

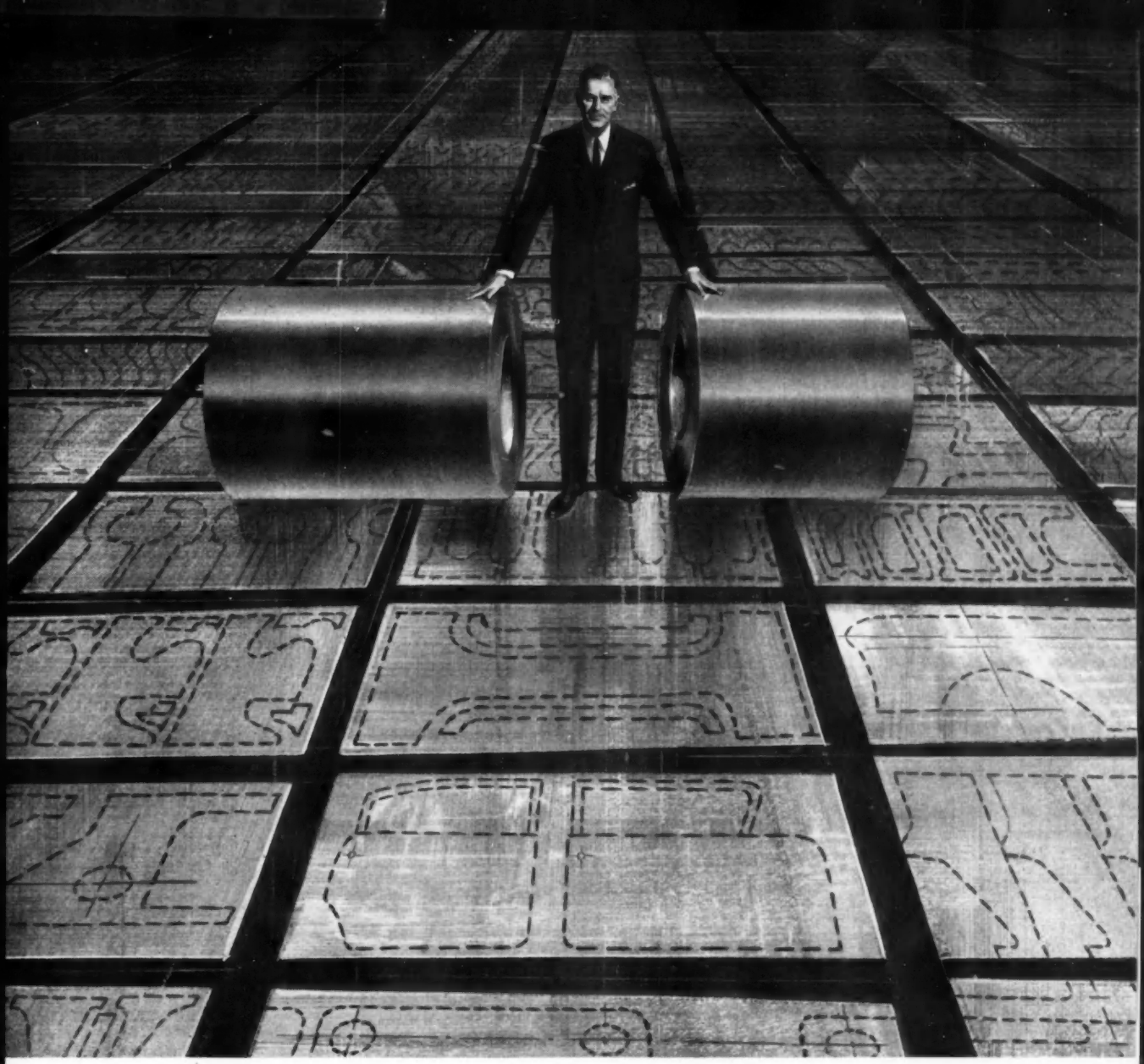
It appears that the first quarter of this year will set a new record of about 455,000 tons primary production. This would indicate a total production of some 1,900,000 tons for the whole year barring any extended work stoppage. This would represent about 85 per cent of 1958 capacity or more realistically, about 73 per cent of 1959-60 capacity when planned new facilities are completed. It readily follows that an aluminum shortage is not in sight either this year nor in 1960.

Price Concessions Noted

There are other problems ahead beside unused capacity. The price of aluminum is none too rigid. While list prices for pig and ingot are maintained by the producers, in the sharp competitive struggle

(*Turn to page* 64, *please*)

Circle 124 on Inquiry Card, for more Data



IN PRODUCT AFTER PRODUCT AFTER PRODUCT . . . WEIRTON HOT- AND COLD-ROLLED SHEET

In automobiles and portable TV cabinets, in air conditioners, stoves and laundry equipment—in almost any application you can name you'll find Weirton hot- and cold-rolled sheets at work.

Their roles: helping one manufacturer after another to produce standout products at low cost with no hitches in fabrication.

You can put to good use the uniform gauge, strength and ductility of Weirton hot- or cold-rolled sheet.

Weirton is always ready to serve your needs for quality sheets. For prompt and complete service just phone or write Weirton Steel Company, Dept. T-3, Weirton, West Virginia.

WEIRTON STEEL COMPANY

WEIRTON STEEL COMPANY

WEIRTON, WEST VIRGINIA

a division of

NATIONAL STEEL CORPORATION

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS

PRODUCTION—VEHICLES—AIRCRAFT

By Samuel Cummings

COMPUTER RUNS REFINERY

Computer manufacturers as well as oil and chemical producers are eyeing with great interest a new "breakthrough" hailed as the first big step to full automation.

The new development took place at Texaco's Port Arthur refinery, where the first electronic computer to completely control an industrial process recently went into operation.

James W. Foley, Texaco president, said this is the first time that the so-called "loop" of computer control has been closed on a full-scale plant operation.

Until now, Mr. Foley pointed out, computers have analyzed data and, performed calculations that were used in the control of the refining process. Now the Texaco computer, a Thompson Ramo Wooldridge RW-300 digital unit, goes further than any computer ever used in oil refining—it feeds judgments back into the plant and actually controls its operations.

Texaco's computer-controlled plant is a polymerization unit. It blends a mixture of various gases under high pressure and temperature control in the presence of a catalyst. The resulting product is a high-test gasoline blending stock. The unit handles about 15 million cu ft of gas a day and its output of blending fuel is over 1800 barrels a day.

The RW-300 computer analyzes incoming gases and also measures pressures, rate of flow, and temperatures. It relates these to both input and output, figures catalyst activity, and evaluates all these variables. It then decides what processing changes are needed to get the best product for the least cost. Finally, it resets the plant's controls to get maximum efficiency —and it rechecks the results every 5 minutes, 24 hours a day.

Texaco engineers worked in cooperation with Thompson Ramo Wooldridge for nearly 2½ years to prepare the plant's processes for full computer control. First a feasibility study was made and then a model showing the physics and chemistry of the process was built. It took a team of engineers more than five months to prepare the model from available data.

Texaco hopes the new control system will boost the plant's efficiency by as much as 10 per cent. Savings from efficient use of the catalyst materials alone are expected to be about $75,000 a year. Besides these gains, Mr. Foley said, "We also look upon the plant as an unparalleled experimental ground where we will gain invaluable knowledge and experience for future computer use."

MICRO-MODULES

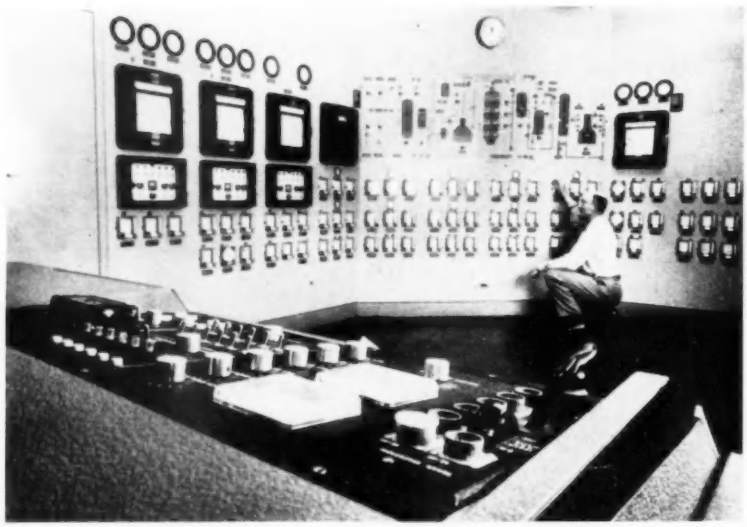
A new advance in miniaturization is made possible by the development of micro-modules — tiny ceramic tubes that do the work of electronic parts.

The new devices were developed by Radio Corp. of America for the Army Signal Corps. They measure only a third of an inch on each side. A cubic inch will hold 27 modules.

By using the "disciplined geometry" of micro-modules, engineers now can cut down the size of present-day equipment by a factor of from 10 to 20 to 1, according to Dr. Charles B. Jolliffe, RCA vice-president.

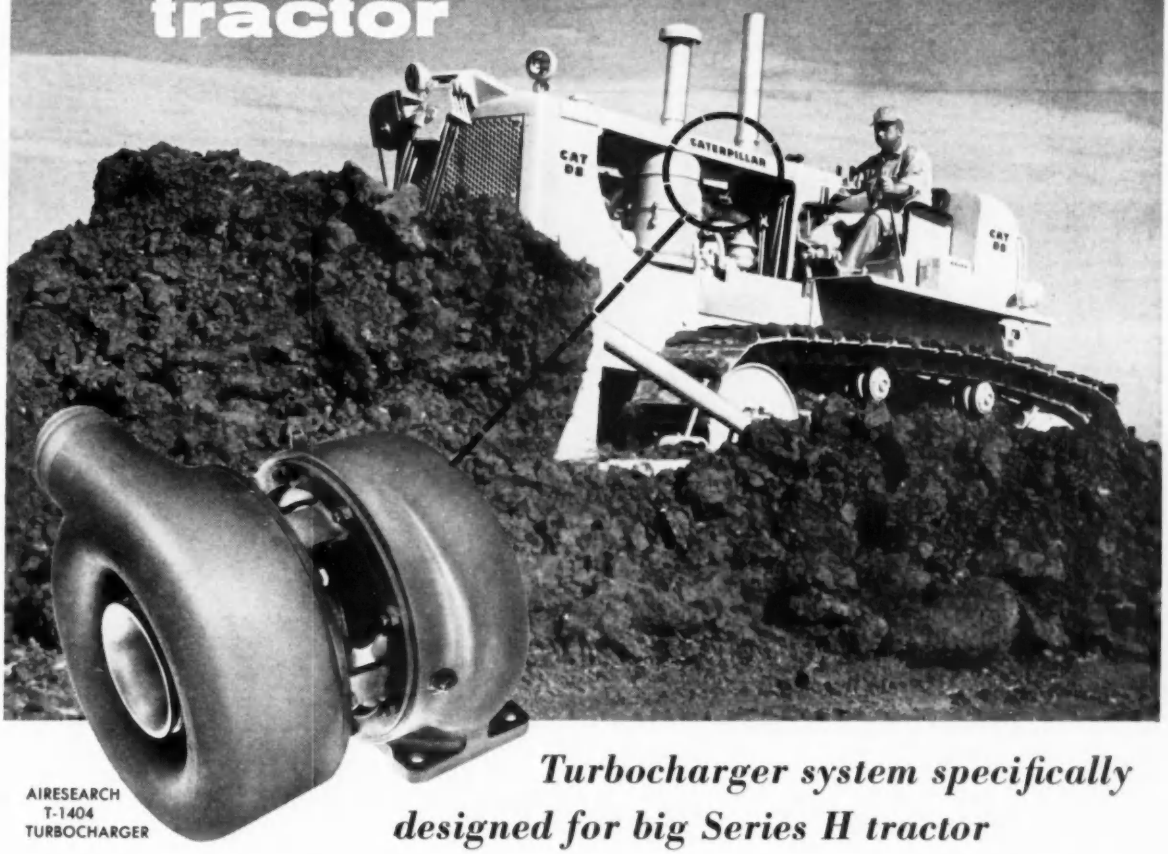
Micro-modules are composed of micro-elements — tiny wafers of conducting, semiconducting, or insulating materials, one-hundredth of an inch thick and a third of an

(*Turn to page* 64, *please*)



Control room of Texaco's $4 million polymerization refinery unit. Thompson Ramo Wooldridge RW-30 computer is shown in foreground with controls set on automatic.

More horsepower for the new Caterpillar D8 tractor



AIRESEARCH
T-1404
TURBOCHARGER

Turbocharger system specifically designed for big Series H tractor

A joint development of Caterpillar and AiResearch, the turbocharger system is an integrated part of the new D8 Series H tractor. Extensive field tests showed an increase of 20% in bulldozing and a substantial gain in pushloading production with the Series H... brought about by the tractor's greater horsepower, faster torque rise, greater weight and faster dozing and reverse speeds.

Specifically designed to match the new tractor's requirements, the new turbocharger underwent thousands of test hours on the new D8 operating in every kind of material on every kind of job.

AiResearch turbocharger advantages include: increased horsepower, improved lugging ability, cooler exhaust temperatures, reduced maintenance costs, less smoking and noise. This is another application of AiResearch turbochargers to heavy industrial machinery.

THE GARRETT CORPORATION

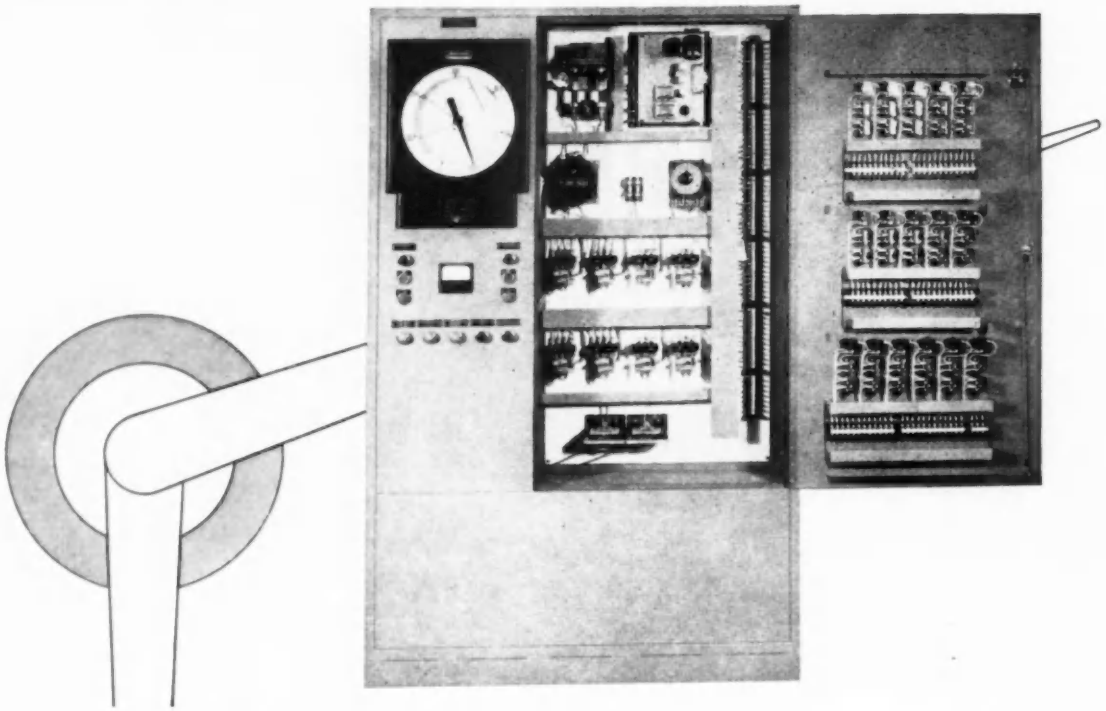
AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

Circle 125 on Inquiry Card, for more Data

FINISHING SYSTEMS...



ENGINEERED for CONTROL, DEPENDABILITY, QUALITY and SAFETY!

A Modern Finish Baking Oven is not just an indiscriminate assembly of insulated panels, heating units, ducts, fans, blowers, motors, etc.

The Mahon Oven Control Panel, illustrated above, was engineered and built by Mahon for one Mahon Finish Baking Oven which was specially designed to meet the exacting requirements of a particular manufacturer. This is just one example of how each component is thoroughly engineered into Units of Mahon Finishing Equipment to insure quality construction throughout, functional dependability, positive control and maximum safety in operation.

If you are considering a new finishing system, or any unit of finishing or processing equipment, you will want to discuss your requirements with Mahon engineers . . . you'll find them better qualified to advise you on possible production layouts, and better qualified to do the initial planning and engineering which plays such an important role in the ultimate operating efficiency of specially designed equipment of this type.

See Sweet's Plant Engineering File for Information, or Write for Catalogue A-659

THE R. C. MAHON COMPANY • Detroit 34, Michigan

SALES-ENGINEERING OFFICES in DETROIT, NEW YORK and CHICAGO

. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!

MAHON

Circle 126 on Inquiry Card, for more Data

Circle 127 on Inquiry Card, for more Data →

Who Buys Roebling Upholstery Spring Wire After You Do?

The end-user can hardly be expected to know a great deal about Roebling helical spring wire, border and brace wire, zigzag and no-sag wire, wire for automatic machines, lacing wire...

Thus, the qualities of uniformity, temper, tensile strength, size and finish that are yours whenever you use Roebling Spring Wire mean long life, resiliency under constant use (and abuse) where it counts the most...to those who buy Roebling Upholstery Spring Wire after you do.

For further information on the wide range of types, the consistent superiority and availability of these and other Roebling wire products, write Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

Roebling...Your Product is Better for it

ROEBLING

Branch Offices in Principal Cities

Subsidiary of The Colorado Fuel and Iron Corporation

"Customeered" components basic to industry

ideas on "Customeered" RUBBER PARTS

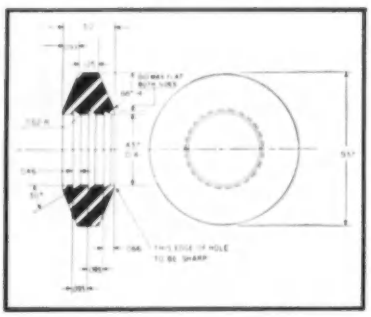
...their design and application for improved product performance **No. 1**

New ORCO continuous process now custom molds precision rubber parts in volume—at less cost!

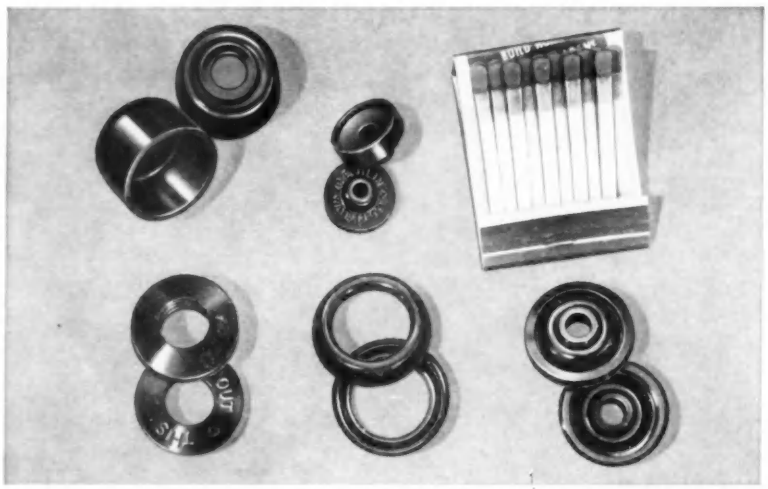
Precise tolerances within ±0.003 in. are now possible in large volume production of custom-molded rubber component parts. Ohio Rubber's new high-speed, continuous molding process produces such parts at rates of up to 200,000 pieces per day.

Greater precision, which results in important savings on finishing costs, is assured through use of single-cavity, self-registering molds. They permit accurate, uniform application of pressure to minimize flash—maintain consistent tolerances for all dimensions. Uniform material thickness is equally assured by a plasticizing mill, which as an integrated part of the process directs uniform charges to each mold.

Direct feeding, from the mill to the mold wheel, eliminates the conventional intermediate extrusion step and further insures part uniformity and quality consistent with specifications. The continuous process permits *precise* control of time and temperature for each part.



High-precision is indicated in the close tolerances of this quadruple-landed seal for auto shock absorbers—more economically produced in volume through Ohio Rubber's new high-speed, continuous molding process.



Wide range of parts being more economically produced through Ohio Rubber's new molding process include (top, left to right): valve stem deflector, condenser seal, (bottom) seal piston rod packing, universal joint seal, and oil seal. These, like all the many other small, *precision* parts already produced or being produced, vary in dimensions up to 1½" in diameter and 1" in thickness.

Large volume production results in substantial cost savings for small, precision parts requiring tolerances obtainable by other precision molding processes. For parts formed by less precise, conventional methods, performance can be improved through greater accuracy—and without prohibitive increase in cost.

Quantity requirements involving 500,000 or more parts annually are recommended for most advantageous use of the new process. Since two similar parts of different size can be produced simultaneously by alternating the molds on the molding wheel, lower production runs which might not be economical can be combined with a separate order.

Complete information on this revolutionary new process is available in bulletin form. Send for your free copy today. At the same time, be sure to inquire about Ohio Rubber's complete component "Customeering" service—molding, extruding, and bonding-to-metal. Just mention ORCO Bulletin 715.

9DE1

THE OHIO RUBBER COMPANY

WILLOUGHBY, OHIO

A DIVISION OF THE EAGLE-PICHER COMPANY

• • INDUSTRY STATISTICS • •

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending April 18	Weeks Ending April 11	Year to Date 1959	Year to Date 1958
PASSENGER CAR PRODUCTION				
Total—American Motors	9,441	9,017	124,677	50,037
Chrysler	2,115	2,214	24,451	18,042
De Soto	1,311	1,334	18,853	11,988
Dodge	5,139	5,278	55,302	32,701
Imperial	527	528	7,440	5,423
Plymouth	14,106	13,586	132,214	123,238
Total—Chrysler Corp.	23,198	22,940	238,260	191,392
Edsel	966	897	16,193	4,914
Ford	32,331	32,063	482,812	328,394
Lincoln	728	611	10,671	10,883
Mercury	2,339	3,053	51,356	38,930
Total—Ford Motor Co.	36,364	36,624	561,032	383,121
Buick	4,649	4,533	99,693	91,992
Cadillac	3,392	3,394	54,940	48,077
Chevrolet	36,120	33,810	533,565	468,824
Oldsmobile	9,324	9,436	139,090	119,221
Pontiac	10,157	9,711	141,763	84,158
Total—General Motors Corp.	63,642	60,884	969,051	812,272
Total—Studebaker-Packard Corp.	3,299	3,728	59,294	11,860*
Checker Cab	167	41	1,665	1,240
Total—Passenger Cars	136,111	133,234	1,953,979	1,449,922
TRUCK AND BUS PRODUCTION				
Chevrolet	8,844	8,670	123,276	92,694
G. M. C.	1,883	1,680	27,480	19,887
Diamond T	130	101	2,031	1,711
Divco	80	80	1,124	924
Dodge and Fargo	1,632	1,616	26,807	16,556
Ford	7,018	6,863	101,012	70,622
F. W. D.	10	19	309	465
International	3,570	3,288	41,679	33,034
Mack	358	331	5,283	4,723
Studebaker	213	157	4,822	3,446
White	420	410	5,747	5,782
Willys	2,447	2,352	35,745	24,592
Other Trucks	70	65	988	966
Total—Trucks	26,675	25,632	376,303	275,402
Buses	65	15	716	1,191
Total—Motor Vehicles	162,851	158,881	2,330,998	1,726,515

* Includes Packard.

RETAIL CAR SALES BY PRICE GROUPS*

NUMBER OF CARS

Price Group	January 1959 Units†	January 1959 % of Total	January 1958 Units†	January 1958 % of Total
Under $2,500	91,365	23.81	226,598	62.38
$2,501 to $3,500	248,818	64.85	98,514	27.13
$3,501 to $4,500	27,670	7.21	19,813	5.46
Over $4,500	15,853	4.13	18,256	5.03
Total	383,708	100.00	363,181	100.00

DOLLAR VOLUME OF SALES

Price Group	January 1959 Dollars	January 1959 % of Total	January 1958 Dollars	January 1958 % of Total
Under $2,500	$211,244,771	19.37	$532,722,487	54.37
$2,501 to $3,500	685,520,341	62.86	277,331,744	28.31
$3,501 to $4,500	106,273,839	9.75	75,246,231	7.68
Over $4,500	87,455,906	8.02	94,458,195	9.64
Total	$1,090,494,857	100.00	$979,758,657	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

REGISTRATIONS OF FOREIGN CARS

February

1959		1958	
Volkswagen	7,428	Volkswagen	5,807
Renault	5,390	Renault	2,218
English Ford	3,330	English Ford	1,516
Simca	2,856	Hillman	936
Opel	2,755	Simca	908
Fiat	2,619	Fiat	878
Hillman	2,011	M. G.	838
Vauxhall	1,610	Opel	726
Triumph	1,477	Triumph	716
Volvo	1,359	Metropolitan	673
All Others	9,297	All Others	4,894
Total	40,132	Total	20,110

1959 NEW REGISTRATIONS

Arranged in Descending Order According to the Two Month 1959 Totals

NEW CARS

Make	February 1959	January 1959	February 1958	Two Months 1959	Two Months 1958
Chevrolet	106,506	106,543	92,401	213,049	196,509
Ford	103,498	96,501	71,865	199,999	151,669
Oldsmobile	27,732	28,108	24,789	55,840	54,478
Pontiac	27,349	25,489	18,556	52,838	40,209
Plymouth	20,600	26,533	27,091	47,133	60,007
Rambler	21,856	21,037	9,062	42,893	17,722
Buick	20,828	21,625	21,357	42,453	48,666
Cadillac	11,906	11,911	9,769	23,817	20,631
Mercury	11,084	11,136	9,699	22,220	20,665
Studebaker	9,808	9,387	2,913	19,195	6,436
Dodge	7,655	9,862	9,805	17,517	21,473
Chrysler	3,812	4,389	4,565	8,201	10,835
Edsel	3,936	3,610	3,565	7,546	8,611
De Soto	2,841	3,275	3,919	6,116	8,969
Lincoln	2,503	2,529	2,718	5,032	5,624
Imperial	1,228	1,533	1,245	2,761	3,242
Misc. Domestic	519	238	389	757	867
Foreign	40,132	35,806	20,110	75,938	39,445
Total—All Makes	423,793	419,512	333,818	843,305	716,058

NEW TRUCKS

Make	February 1959	January 1959	February 1958	Two Months 1959	Two Months 1958
Chevrolet	23,761	23,565	16,897	47,318	34,553
Ford	19,498	17,373	14,058	36,864	28,685
G. M. C.	5,249	5,015	3,646	10,262	7,575
International	5,109	4,853	6,414	9,961	13,939
Dodge	3,674	3,416	2,807	7,090	5,846
Willys Truck	1,205	1,371	910	2,576	1,886
White	1,100	843	899	1,942	1,709
Mack	937	991	681	1,927	1,526
Willys Jeep	546	628	397	1,174	816
Studebaker	476	445	277	921	667
Diamond T	179	227	251	406	444
Brockway	58	83	51	141	113
All Others	2,896	2,986	1,896	5,882	3,829
Total—All Makes	64,688	61,798	49,186	126,484	101,588

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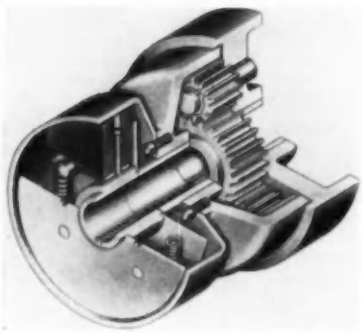
NEW PRODUCTS
AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Planetary Transmission

A packaged drive has been designed to provide smooth, automatic starting in either forward or reverse without



gear shifting. The combination clutch and forward-reverse transmission is available for mounting directly to crankshaft extensions of 1½ to 7 hp gasoline engines.

The transmission consists of four simple assemblies: (1) the automatic centrifugal clutch; (2) a clutch drum assembly; (3) the brake drum assembly; and (4) a sun gear. *Fairbanks, Morse & Co.*

Circle 60 on postcard for more data

Low Headroom Hoists

Robbins & Myers, Inc., Hoist & Crane Div. has introduced Type F3 electric hoists which are available in capacities from 1½ through 7½ tons. The five ton model requires only 24 in. of headroom.

Motor and control box on the hoists are totally-enclosed and weathertight.

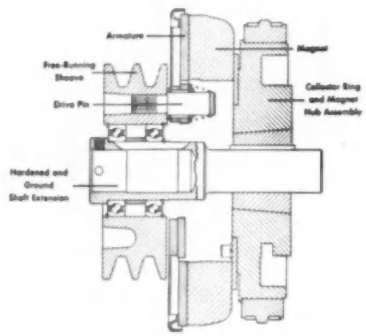
They are powered by a 7½ hp, 30 minute, 55 degree rise, totally enclosed motor with weatherproof brake.

Circle 61 on postcard for more data

Packaged Electric Clutch

Electro-Sheave, a combined electric clutch and sheave assembly for direct installation on all standard NEMA electric motor shafts, has been announced by *Warner Electric Brake & Clutch Co.* Five sizes of standard clutch units, rated from 1 to 25 hp, are in production.

Electro-Sheaves engage or release at any speed. For inching or jogging, several starts are possible in less than one revolution of the clutch



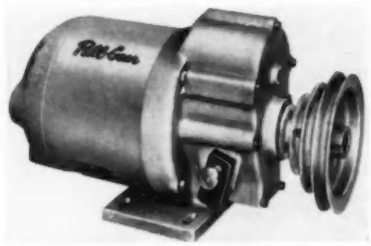
without what is considered normal wear and tear on motors, controls, or machinery. Release is instantaneous and the load is braked without plugging the motor.

Circle 62 on postcard for more data

Motorized Speed Reducer

An economically priced speed reducer for drill presses, lathes, boring mills and similar belt-driven machines, extends the machine capacity to permit larger reaming, tapping, boring and other work on these normally light-duty machines.

The precision-geared, single-unit type reducer provides extra operating torque at reduced machine speeds. However, the attachment does not overload the machines and is said to



eliminate the danger of stalling or burning the machine motor. *The Pull-Gear Co.*

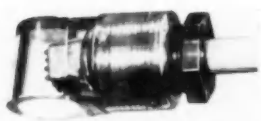
Circle 63 on postcard for more data

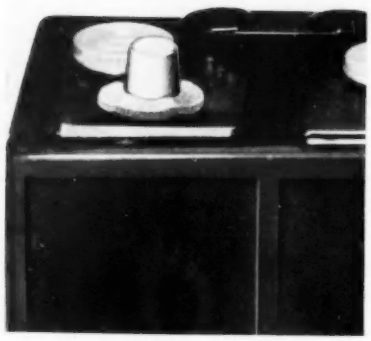
Plastic Battery Cable

This plastic battery cable is said to eliminate battery terminal corrosion and features a plastic cable head and threaded nylon connector that encases the terminal and cable end. The cable is air tight, impervious to acids, oil and gas. Between the head and battery is a sodium hydroxide impregnated felt washer that neutralizes sulphuric acid and completely seals the connection.

The Radsco cables can be used on automobiles, trucks, farm equipment and machinery, and airplanes. One style cable fits positive and negative terminals on either 6 or 12 volt batteries. *Truck Equipment Distributors, Inc.*

Circle 64 on postcard for more data





Aircraft Locknut

Designed for temperature applications up to 800 F on aircraft and missiles, the FN 812 locknut is made of austenitic stainless by the *Standard Pressed Steel Co.* The external hexagon drive nut meets the requirements of the MIL-N-25027 specification.

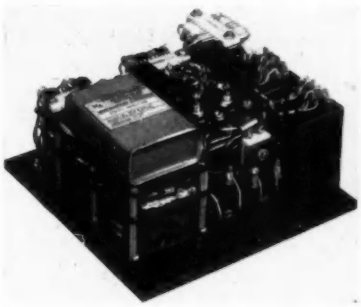
Applications include use with both tension and shear bolts in structural and sheet metal assemblies, bulkhead mountings of major components and other critical fastenings on airframe, engines and missiles. Magnetic permeability is held to a maximum of 2.0 oersteds.

The FN 812 is being produced initially in diameter sizes of No. 4 through ⅜ in.

Circle 65 on postcard for more data

Static Power Inverter

A solid state static power inverter, utilizing transistor and magnetic amplifier circuitry to convert a 26 to



30 v d-c source to an 115 v, 400 cps, single phase a-c source has been designed by *Magnetic Amplifiers, Inc.*

The unit was designed for use in missiles, aircraft and ground equipment, and in jet aircraft ignition systems. The unit weighs 12½ lb and measures 8-1/16 by 8-1/16 by 4 in.

Circle 66 on postcard for more data

Cam, Flange Slides

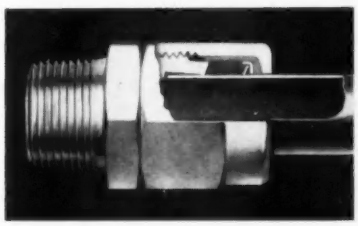
The *Ohio Knife Co.* 1000 series of cam and flange slides can be used for cut-off, blanking and forming. The slides are available in lengths or bars up to 125 in.

The cutting or forming edge is hardened, machined and ground at the factory and the soft steel backing, to which special hardened tool steel is bonded, can be easily drilled for dowel or screw holes. This series offers many other uses including application for draw and pinch trim dies, heels, forming, flanging, back-up plates or as guides and hold down gibs.

Circle 67 on postcard for more data

Pneumatic Tube Fitting

Developed especially for hydraulic and pneumatic systems, the Rubbernek flareless, vibration-absorbing fitting overcomes causes of tube connection failure. The design permits a leak-proof joint, yet permits tube



movement, even where tubes are misaligned due to manufacturing variables.

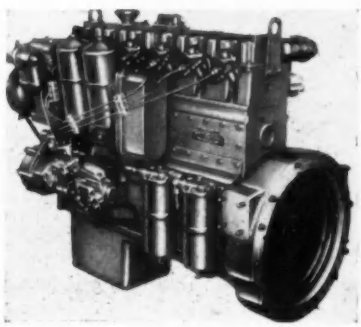
A built-in positive stop prevents over or under torquing the fitting, and assures proper installation without special tools. *Chicago Forging & Mfg. Co.*

Circle 68 on postcard for more data

Versatile Engine

This engine, designated the LDS-427 Hypercycle, is of six-cylinder inline design, liquid-cooled and turbosupercharged, and has a piston displacement of 427 cu-in. It will operate on No. 1 and 2 Diesel fuels, as well as kerosene, JP-4 turbine fuel, and low and regular grades of gasoline.

The fuel is sprayed directly onto



the combustion chamber wall which is said to prevent knocking even when low grades of fuel are used. *Continental Motors Corp.*

Circle 69 on postcard for more data

Filter Assemblies

Two lines of standardized T-type in-line filters and replacement elements for high and low pressure applications from minus 350 to plus 350 F are available from *Bendix Filter Div. of Bendix Aviation Corp.*

The filter assemblies and replacement elements, with filtration ratings from 2 to 250 microns, cover flow ranges from one to 24 gpm with MIL-H-5606 and 200 to 2500 scfm with air at 3000 psi. They are suited to applications in manned aircraft, missiles, test stands and ground support equipment, as well as for general industrial use.

Circle 70 on postcard for more data

Continuous Duty Motor

This light weight continuous duty 4 hp, 400 cycle ac motor has been designed by *Hoover Electric Co.* The

unit is in use on aircraft, missile and ordnance equipment and offers an infinite variety of intermediate speeds from 20,000 and lower to ½ and 1/10 rpm with reduction gearing.

Circle 71 on postcard for more data

Bronze Filter

An Oilite bronze filter has been designed for use as a safe vent for underground gasoline storage tanks. The vent utilizes a 40 to 50 per cent bronze porous filter. This material has the unique ability to shed rain, dirt and other contaminates while allowing easy passage to escaping gas fumes.

Acting as a barrier to fire, the filter matrix keeps flames from striking back into the tank should escaping vapors ignite. The tank vent is simply screwed onto an upright pipe vent. *Amplex Div., Chrysler Corp.*

Circle 72 on postcard for more data

METALS

(*Continued from page* 54)

for business there are reports of freight rebates, special services and free advertising being given to important buyers. Some foreign metal is coming in to domestic fabricators at discounts of about 1½ cents a pound.

In the face of this it appears doubtful if producers will be successful in advancing the price after July, to compensate for an expected wage increase. Until June 30th the price is frozen at present levels of 24.7 cents for pig and 26.8 cents for ingot. Nevertheless it is quite possible the attempt will be made.

More Competition for Fabricators

Domestic producers who have heretofore had the fabricating field pretty much to themselves in this country may encounter more competition from across the border. Aluminium Ltd., traditionally a seller of ingot to independent fabricators, is likely to develop into an integrated producer and look for sales expansion in the lucrative U. S. market. Steel producers are unlikely to pass with unconcern the efforts of the aluminum industry to capture some of their markets. It can be expected that the months ahead will see determined efforts to woo the homeowner with steel products for the home, especially in stainless, in competition with the hard hitting advertising efforts of the aluminum producers.

Doubtful Improvement in Zinc Situation

The latest figures from the Zinc Institute give producers neither cause for cheers nor reason for alarm. On the favorable side is the fact that shipments rose to a daily rate of 2381 tons in March against 2344 tons in February. On the other hand production of slab zinc increased to a daily rate of 2578 tons and in consequence stocks of metal at the smelters rose 5600 tons during the month. In short, in spite of the quotas set up on imports there is still too much metal being produced for the industry's good.

This was declared by a Congressional sub-committee, who found that present quotas have failed to reopen any mines or reduce domestic inventories. Stricter curbs on imports were urged. A bill was proposed to stabilize lead at 15½ cents a pound and zinc at 13½ cents during a base quarter. However it does not appear to have much chance of passage.

Diecasters Not Buying

The real trouble with zinc is the distressingly low demand for Special High Grade from the diecasters who constitute, next to the galvanizers, zinc's largest sales outlet. Hopes were high that Detroit would call for a normal tonnage as automobile output increased. This hasn't happened although some improvement has been recently noted. The call for Prime Western from the galvanizers has been excellent but the industry needs orders from the diecasters as well to be in a prosperous condition.

Smelters Cut Copper Price

After having held at 34 cents a pound for nearly a month the smelter price of copper plunged swiftly to 32 cents in mid-April. The move was precipitated by weakness in scrap copper and persistent selling in London, where there were reports that demand was laggard for metal while mine output was climbing steadily.

No doubt much of the speculative buying had been stimulated by expected strikes which did not materialize. Further impetus was furnished by inventory purchases in advance of the probable work stoppage in July. How much of this has gone on is anyone's guess. Sales in March of about 124,000 tons were not excessively large, but exceeded domestic mine output, plus secondary, by about 7000 tons. ■

AUTOMATION NEWS REPORT

(*Continued from page* 56)

inch square. Each micro-element is processed to do the job of a conventional component, such as a resistor, transistor, capacitor, diode, or inductor.

A group of these micro-elements —stacked up and interconnected to form the micro-module itself— operates as a complete circuit. They can be made to do the job of amplifiers, oscillators and other complex electronic parts. In time it will be possible to combine different circuit functions into a single block.

The Signal Corps plans to award contracts for building prototype production machinery at a later phase of the program. This would set the stage for volume production of modules having a wide variety of functions.

Meanwhile micro-module samples developed under the RCA contract will be made available to other manufacturers to aid them in designing prototype equipment.

ELECTRONIC ROBOT

Electronic robots are moving higher up the employment ladder— heading dangerously close to the executive level.

A new machine developed by Westinghouse Electric Corp. has the almost inhuman ability to choose between right and wrong decisions correctly—if all the tubes, transistors, and other components are in good working order.

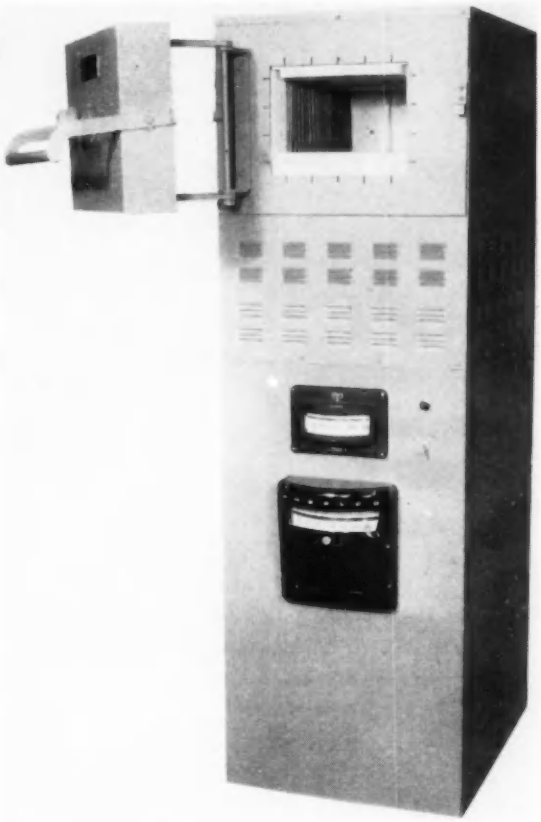
The new machine — an "optimizing control" device called Opcon —is now being readied to run a complete distillation column in the Sun Oil Co., refinery in Pennsylvania. Other uses will follow.

Westinghouse won an American Association for the Advancement of Science award for Opcon because it "replaces the pre-set, routine functions performed by a conventional (electronic control) system with the human-like process of reaching a logical conclusion through experiment." ■

NEW PRODUCTION and PLANT EQUIPMENT

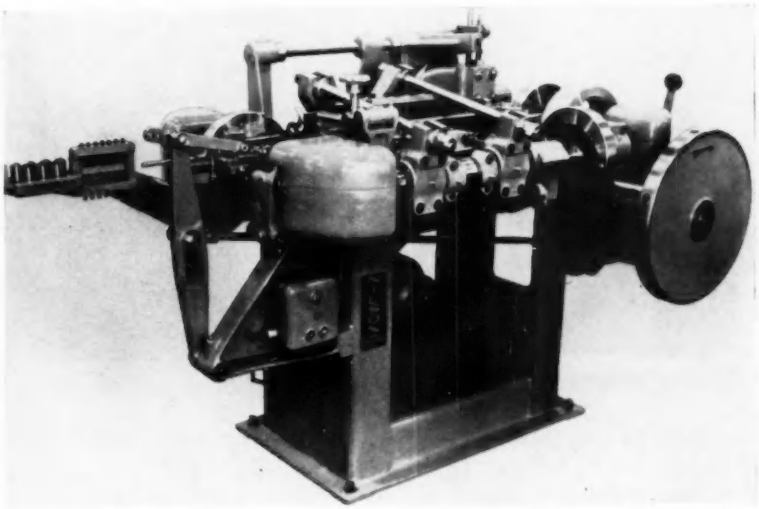
Continued from page 50

Non-Atmosphere Box Furnace Operates To 2250 F



The Type RDB-47 non-atmosphere box furnace pictured here has been developed by the Pilot Plant Equipment Div. of Lindberg Engineering Co. The use of a high temperature alloy heating element permits a maximum operating temperature of 2250 F. The furnace chamber is 5⅜ in. high, 14¼ in. deep, and 8½ in. wide. A metallic packing, recessed in the inner face of the door, eliminates brick to brick contact thereby minimizing dusting and heat loss. An atmosphere retort, with a work area of 4¾ in. high, 7¾ in. wide, and 13⅜ in. deep is available as an accessory.

Circle 58 on postcard for more data



Nilson combination press and 4-slide forming machine uses minimum floor space

Combination Press and 4-Slide Forming Machine

THE compact No. S-1-F combination press and 4-slide forming machine is mounted on a welded steel pedestal base for maximum strength and rigidity.

To achieve minimum floor space, the variable speed motor drive is positioned directly in back of the machine, instead of on the end. Floor space required is 53 by 57 in.

The machine is designed primarily to stamp and form ribbon metal in one operation. But it will also form wire with a maximum feed length of eight inches. It can handle wire up to 3/32 in. in diam and ribbon metal up to 1¼ in. wide. The built-in press section has a ¾ in. stroke and a maximum pressure capacity of eight tons. A two hp motor drive permits speed ranges from 57 to 200 spm. *The A. H. Nilson Machine Co.*

Circle 45 on postcard for more data

Electric Lift Trucks

The Elwell-Parker Electric Co. has designed a line of electric powered lift trucks having 2000 and 3000 lb capacity. The trucks feature a special low height operator seat for maximum safety in low head room areas. They can make a right turn in a 58 in. wide aisle; also, the trucks can right angle stack in a 109¼ in. wide aisle.

Circle 46 on postcard for more data

Adjustable Speed Drive

A LINE of adjustable speed drives in the 1/6 to 10 hp range is available from *Cleveland Machine Controls, Inc.* These drives employ a magnetic amplifier unit driving thyratrons in a full wave circuit, followed by a dc shunt motor. Speed ranges of 100 to 1 and regulation percentages of 1 to 2 per cent are attained without tachometer feedback.

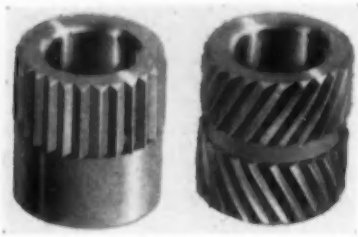
Standard optional characteristics include dynamic braking, reversing, jogging, remote control, torque limiting and line voltage compensation.

Circle 47 on postcard for more data

(*Turn to page 66, please*)

NEW PRODUCTION and PLANT EQUIPMENT

Drill Jig Bushings



Ex-Cell-O is introducing a line of drill jig bushings for use in plastics. The bushings are made of oil-hardening bearing steel. Two basic types are offered—one for embedding in castable materials and one for pressing into holes in plastics, wood or other soft or ductile materials. (Ex-Cell-O Corp.)

Circle 48 on postcard for more data

Steel Strapping Machine

THE Model 13 lightweight power operated portable round steel strapping machine tensions, ties and cuts round steel strapping in one operation.

Weighing 20 lb, and measuring 11 by 7 by 6¼ in., the air powered machine can be held by the operator or suspended from a simple counter balancing mechanism. It can be powered by 65 lb of air pressure from the

U.S. Steel Model 13 steel strapping unit

regular shop compressed air supply. Uniform tension is applied automatically regardless of the size package or number of straps used. However, tension can be changed by a simple adjustment on the machine. *United States Steel Corp.*

Circle 49 on postcard for more data

Honing Machine

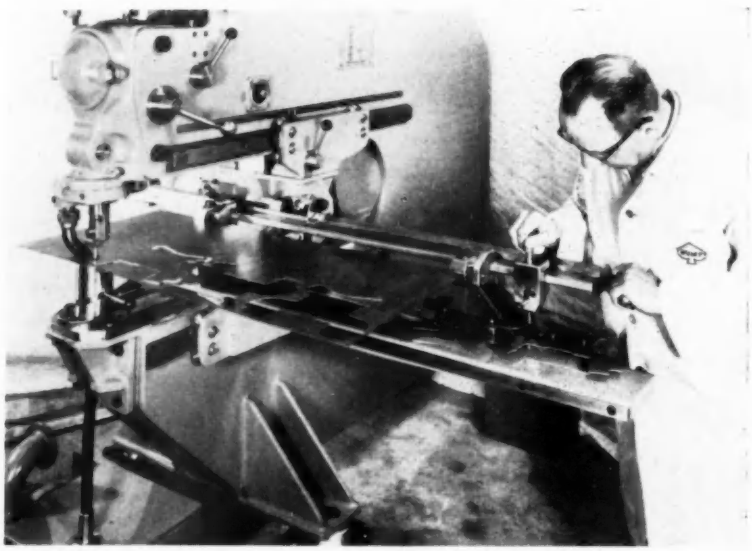
MOTOR rotors are honed at the rate of 200 parts per hour on the BarnesdriL special two station production honing machine. The rotors are constructed of laminated steel and vary from 3 to 4 in. in length in different lots. Required bore size in all the parts remains constant at 0.8750 to 0.8755 in., with a surface finish of 25 rms. *Barnes Drill Co.*

Circle 50 on postcard for more data

Machine Mechanizes Hand-Lapping Technique

The Spiralap line of flat lapping machines is designed to eliminate the manual work characteristic of hand lapping while providing extreme precision on flat work surfaces. Lapping accuracy to within one light band is possible on this equipment. Quality control is maintained through the ability of the Spiralap to relap its own plates. This relap procedure takes only a few minutes. As the plate rotates, a steady supply of compound moves between the workpiece and the plates, inducing consistent abrading action. (Micromatic Hone Corp.)

Circle 51 on postcard for more data



Cosa copy nibbler is available with throat depths of 41, 49, and 59 in.

Copy Nibbling Machine Works Directly From Template

THIS copy nibbling machine will reproduce blanks or cut-outs of any shape directly from a master or template. It will also perform shearing, beading, folding, flanging, peening and slotting operations.

On this machine, the sheet does not require turning about to meet the cutting edge of the punch, and does not have to be hand fed through the cutting tool according to a pre-drawn contour. It is clamped to roller bearing-guided coordinates which permit it to be moved in any horizontal direction by guiding a tracer pin along the contours of the template. *Cosa Corp.*

Circle 52 on postcard for more data

Face Milling Machine

THE Luft line face milling unit is designed specifically to perform an accurate facing or milling operation in any given position. It may be mounted conveniently to do any job, can be used for boss milling, face milling, counter boring, etc., and can be handled speedily and economically.

The motor is of vane type design using precision ball-bearings on the shaft and is pressure lubricated through the main feed line. The facing head feeds automatically at the rate of 0 to 0.015 in. per revolution. *Automation Tools, Inc.*

Circle 53 on postcard for more data

Mechanical Force Gage

PICTURED is a mechanical force gage, capable of holding the maximum dial reading, which can be instantly reset to zero by the touch of a finger. The instrument can measure both tension and compression forces directly and should prove suitable for fixture mounting to act as permanent testers for volume inspection of standard items. Their ability to hold the maximum dial reading after the load has been removed suits them for measuring momentary or transient loads, such as peaks and break points; loads which cannot be held steady; and in awkward positions where it is difficult to read the gage dial in the test position. *Hunter Spring Co.*

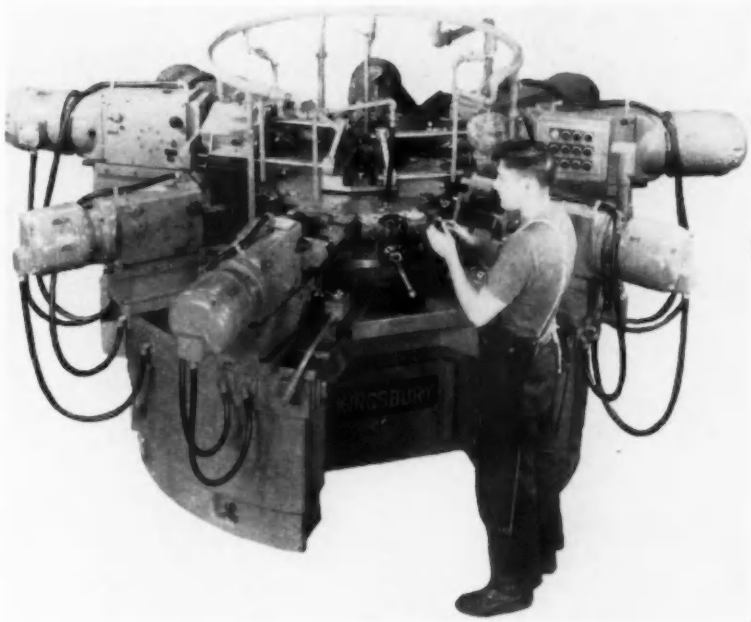
Circle 54 on postcard for more data

Hunter "hold-maximum" force gage

Electrode Holder

THE Handi-Arc electrode holder has a molded pistol grip with a built-in safety cut-out to prevent accidental "flashes" or shocks. The instant the grip is released the current is off. It has heavy-duty milled copper jaws that are adjustable to accommodate rods of different diameters. All working parts are machined copper and a receptacle is found in the handle for self-clamping attachment of lead cord. *Frank Niemi Metal Products, Inc.*

Circle 56 on postcard for more data



Kingsbury multi-unit automatic performs eight operations on weights for exhaust manifolds.

Multi-Unit Automatic Performs Eight Operations

THIS Kingsbury multi-unit automatic performs eight operations on weights for exhaust manifolds. Eight units mill, drill, hollow mill, spotface and ream at a gross production rate of 375 parts per hour.

A 30 in. index table holds eight work fixtures with manual clamping. Two self-centering jaws hold the work and locate it from its contour.

One unit mills the two lugs. The other units perform these seven operations on the hole and hub drill 0.266, drill 0.290 in., rough hollow mill, spotface, finish hollow mill, mill the slot, and ream. The hollow mills are mounted on spindles with flanges so that they do not need guide bushings. The milling units slide on rods that are mounted on the center. *Kingsbury Machine Tool Corp.*

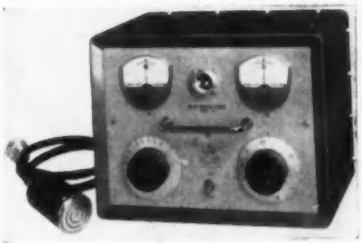
Circle 55 on postcard for more data

Non-Metallic Analyzer

THE D-K analyzer, a gage for non-metallic thickness measurements, is suitable for use in aircraft, missile, and electronic component applications.

Measurements are made instantaneously from one side of insulating sheets such as radomes, nose cones, printed circuits, etc. By a simple dial adjustment, readings may be determined instantly on the thickness of the insulation which is being scanned.

The D-K analyzer is a portable instrument measuring 12½ by 9½ by 10½ in., and weighs approximately 15 lb. Power can be supplied by either a plug-in battery power supply or by interchangeable 115 v, a-c bench power supply. The total power dissipation of the unit is 15 watts. *Delsen Corp.*



Delsen D-K analyzer gages non-metallics

Circle 57 on postcard for more data

Small Cars Predominate at THIRD INTERNATIONAL AUTOMOBILE SHOW

(*Continued from page* 38)

is a three-speed forward type, with the top two synchronized. Suspension is ball joint and coil springs front; semi-elliptic leaf springs at rear. Weight of the car is 2630 lb, and it is priced at $2329 p.o.e.

Later this year the Toyota Motor Co. plans to add a station wagon, The Toyopet Crown, to the line, as well as a low-priced 91-in. wheelbase sports model.

Singer Gazelle

The new Singer Gazelle, billed as Britain's lowest-priced "luxury" car, made its American premiere. It will be available in three models —a two-door sedan, a four-door station wagon, and a two-door convertible—priced, respectively, at $2095, $2425, and $2349 p.o.e.

This Rootes Motors, Ltd., offering is equipped with a four-cylinder ohv engine of 91.2 cu in. displacement, rated 60 bhp at 4500 rpm. Its wheelbase is 96 in. and overall length 163½ in.

Peugeot Wagon

Peugeot, Inc. unveiled its new 403 station wagon, priced at $2490 p.o.e. and reputed to have the longest wheelbase of any of the imported station wagons now on the U. S. market. Its wheelbase is 114½ in. and overall length 181 in. The body, of unitized construction, has four doors plus a rear swing door, and seats six. Overall width is 66 in.

This vehicle is powered by a four-cylinder ohv engine with a piston displacement of 89.6 cu in., rated 65 hp at 4750 rpm. The engine has wet cylinder liners inserted in a cast iron block. Transmission is four-speed, synchronized, with direct drive in third and overdrive in fourth. Front suspension has one transverse nine-leaf semi-elliptic spring; and there are two longitudinal leaf springs in the rear.

Jaguar Mark IX

The latest Jaguar model, the Mark IX four-door sedan, was given its first public showing. Among its features are Borg-Warner automatic transmission as standard equipment (four-speed mechanical transmission and overdrive also are available), power steering, Dunlop disk brakes on all four wheels, and a more powerful engine than in its predecessor, the Mark VIII. The engine in the Mark IX is an ohv type of six cylinders, with twin overhead camshaft, twin carburetors, and a piston displacement of 3.8 litres. It is rated 225 hp at 5500 rpm, as compared to the 210 hp of the prior Mark VIII, 3.4-litre engine.

The wheelbase of the Mark IX is 120 in., and overall length 196½ in. Dry weight is 3976 lb. Its p.o.e. price is about $6300.

Humber Super Snipe

Rootes Motors, Ltd. also presented a new entry in the Humber Super Snipe, a deluxe four-door sedan priced at $3995 p.o.e. For the American market it will come equipped with a heater, Borg-Warner automatic transmission, and power brakes. Of unitizer body construction, the wet weight of the car is 3350 lb. It has a wheelbase of 110 in. and overall length of 184-¾ in. Overall width is 69½ in.

The Super Snipe is powered by a six-cylinder ohv engine of 161.8 cu in. displacement, rated 112 bhp at 5000 rpm. Front suspension is coil springs; rear, semi-elliptic leaf springs.

Daimler Dart

Daimler of England introduced the Dart 2/3-passenger sports car in its initial world-wide "pre-

(*Turn to page* 71, *please*)

WE CAN PROVE, right in your plant, that these Airetool pneumatic production tools do more work at less cost. And we'll show you how Airetool air motors eliminate electrical hazard, keep maintenance costs down to rock bottom. Just write General Manager, Airetool Manufacturing Co., Springfield, Ohio, for obligation-free plant demonstration.

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Annealing furnace at the Shelby mill. Ostuco tubing can be bright or soft annealed, stress relieved, normalized or heat treated.

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"One sure way we have found to eliminate the unpredictable is to specify Ostuco Seamless Tubing. We know from experience we can rely on the precision annealing and unvarying quality of Ostuco tubing that slashes reject rates, helps us produce parts in quantity for profit . . ."

If you want to eliminate the unpredictable in your own plant, then it's time you called your local Ohio Seamless representative. He's listed in the Yellow Pages. Or contact the plant at *Shelby, Ohio —Birthplace of the Seamless Steel Tube Industry in America.*

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BE SURE TO VISIT BOOTH 205 DESIGN ENGINEERING SHOW, MAY 25-28, PHILADELPHIA

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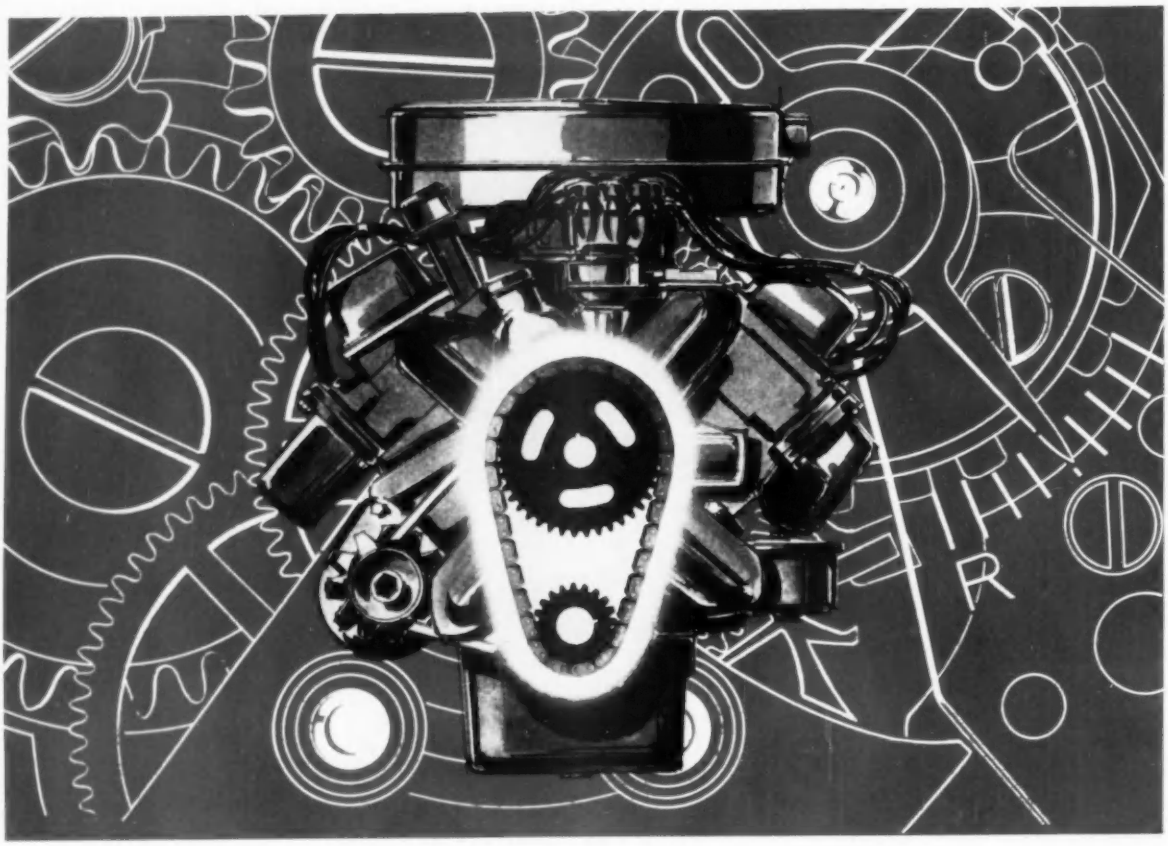
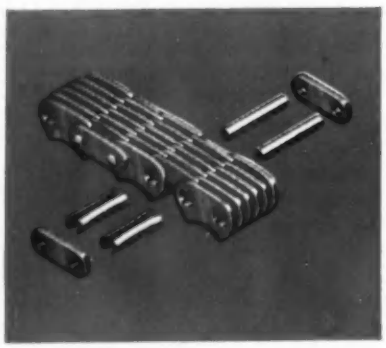


Precise as a watch... and nearly as quiet, Morse Silent Chain times most car engines!



Spring-bushing joint construction of Morse Timing Chain serves as a friction damping device to minimize noise and wear. This new bushing also cuts joint vibration and reduces the tendency to "whip"; provides for take-up of slack. Ask for Catalog C60-51.

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So for original equipment or replacement timing chains, check first with Morse. Want more information or practical engineering help? Call, write or wire today: Morse Chain Company, Detroit, Michigan; Ithaca, New York. Export Sales: Borg-Warner International, Chicago 3, Ill. In Canada: Morse Chain of Canada, Ltd.; Simcoe, Ontario.

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ONLY MORSE OFFERS ALL 4: Roller Chain, Silent Chain, Hy-Vo® Drives and "Timing"® Belts

Third International Automobile Show

(*Continued from page* 68)

production" showing. It is equipped with a brand new V-8 engine, of the ohv type, having a displacement of 152.5 cu in. and a compression ratio of 8.2 to 1, rated 140 bhp at 5800 rpm. The hydraulically-operated brakes are of the disk type, front and rear. Four-speed mechanical transmission is standard; overdrive, and automatic transmission are available as optional equipment.

The body is of reinforced polyester resin, and has retractable glass in the doors. A soft fabric top is standard; while a fiberglass-reinforced plastic top is an available option.

The Dart's wheelbase is 92 in. and overall length 160½ in. It weighs 2218 lb, and will be priced at about $3800.

Aston Martin DB4

The new Aston Martin DB4, a two-door four-passenger sedan featuring high performance, had its American debut at the show. It is equipped with a six-cylinder ohv engine of 224 cu in. displacement, rated 263 hp at 5700 rpm. This engine has an aluminum cylinder head and cylinder block, the latter being fitted with centrifugally-cast cylinder liners. It also has a seven-bearing crankshaft, twin overhead camshafts, and twin carburetors.

Brakes on all four wheels are Dunlop disk type, power assisted. Transmission is a four-speed mechanical type. Coil spring suspension is used both front and rear.

The wheelbase of the DB4 is 98 in. and overall length 176-⅜ in. Width is 66 in., and weight 2884 lb. Its price is in the $10,000 bracket.

DAF 600

One of the most unusual small cars at the show, and the Netherlands' first car on the American market, was the DAF 600 (AI, April 1, 1958, page 71). It is a two-door sedan model, seating four, with an overall length of 142 in. and a wheelbase of 81 in. One of its features is the novel Variomatic transmission, providing automatic operation by use of two pairs of variable-diameter pulleys connected by vee belts. Price of the car is reported to be in the neighborhood of $1500. Weight is 1268 lb.

The DAF's engine is a horizontally-opposed front-mounted, two-cylinder, aircooled unit, with a total displacement of 36 cu in. Horsepower rating is 22 bhp at 4000 rpm.

Latest Developments in Heat Treating

(*Continued from page* 45)

boards and flags or lights to indicate which interlock is open. Zero speed switch interlocks for scanners and high and low interlocks for integrating magazines with infeed conveyor connections are also being used.

The use of direct temperature control measurement of the billet in the forging machines for induction heating, instead of using the furnace wall or general inside area, yields a more accurate control of the billet temperature. The user can forge billets of more uniform temperature held closer to critical melting temperatures. Better flow lines and higher production rates are thus obtained.

Hot metal rails are used in forging units also to insure complete temperature uniformity. Water-cooled rails are employed to produce shadows and adjust temperatures as required on uneven parts.

Rotation and accurate positioning of parts to be hardened now produce hardness and heat pattern tolerances not previously obtainable with old methods. This is a direct outgrowth of the use of an inductor coil which accurately produces a pattern at high density in conjunction with precision-made machine tool fixturing.

A new low-distortion axle hardening process yields straight axles from the hardening machine, and

in fasteners Southern is

reliable

Reliability is the most important product Southern Screw offers its customers. From the receipt of your order through shipment, **reliability** is the important but invisible quality that has built Southern Screw's acceptance over the past twelve years. If **reliability** is one of the unseen but invaluable components of your product, get in touch with Southern Screw about your requirements and our quotation on quality screws, shipped on schedule!

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no final straightening operation is required. This represents a major technological breakthrough in the hardening field. The use of stored heat in one horizontal hardening process (Westinghouse) allows the use of higher carbon steels. The customer can harden more difficult part geometries without cracking. Equipment of this type will shortly be going into use in the motor truck industry.

The close control of power, speed, and position in induction heating equipment enables hardening and tempering in the same machine in many cases. The actual application of this feature is relatively new in industry and is steadily on the increase.

The recent use of low-temperature control devices now permits automatic high-speed control of low-temperature annealing processes. Additional work on short cycle anneal in seconds instead of hours is going on. This is making it possible to have high production in a small area in annealing and tempering operations without atmospheres.

Future Outlook

The future of induction heating with respect to further technological advances is a promising one. Greater cognizance is being taken of the fact that the inductor coil is a tool. The inductors themselves are being made more rugged and accurate with simple alignment and bolt replacement, and "O" ring sealed blind cooling passages. General designs of work-handling machines are becoming sturdier and more exact so that they now rank along with high quality machine tools as pieces of precision production equipment.

Prospects for expanded usage of induction heating equipment are equally bright. It has been proved that certain fundamental operations can be performed better by induction than by any other method. Such advantages of the process as the small amount of committed load in the heaters, lesser floor space occupied and size of the heaters, low radiated heat, close power and temperature control, selective heating ability, and other assets previously mentioned assure it of a secure place in the industrial heating field.

In addition, since power costs are coming down in relation to fuel costs, induction heating's first costs and operating expenses are becoming more competitive with other heating methods. Manufacturers of induction heating equipment confidently expect to hold on to existing applications and find many new ones in the years ahead.

Acknowledgments

The author wishes to express his sincere appreciation to personnel of the following organizations for supplying information on and illustrations of induction heating equipment installations:

Ajax Magnethermic Corp.
General Electric Co., Industrial Heating Dept.
Induction Heating Corp.
Industrial Heating Equipment Association
Lindberg Engineering Co.
Ohio Crankshaft Co., Tocco Div.
Westinghouse Electric Corp., Industrial Electronics Dept.

A note of thanks is also due to the automotive manufacturers who furnished data on their induction heating equipment installations. ■

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Every manufacturer, design and production man should have this valuable data. Sent upon request.

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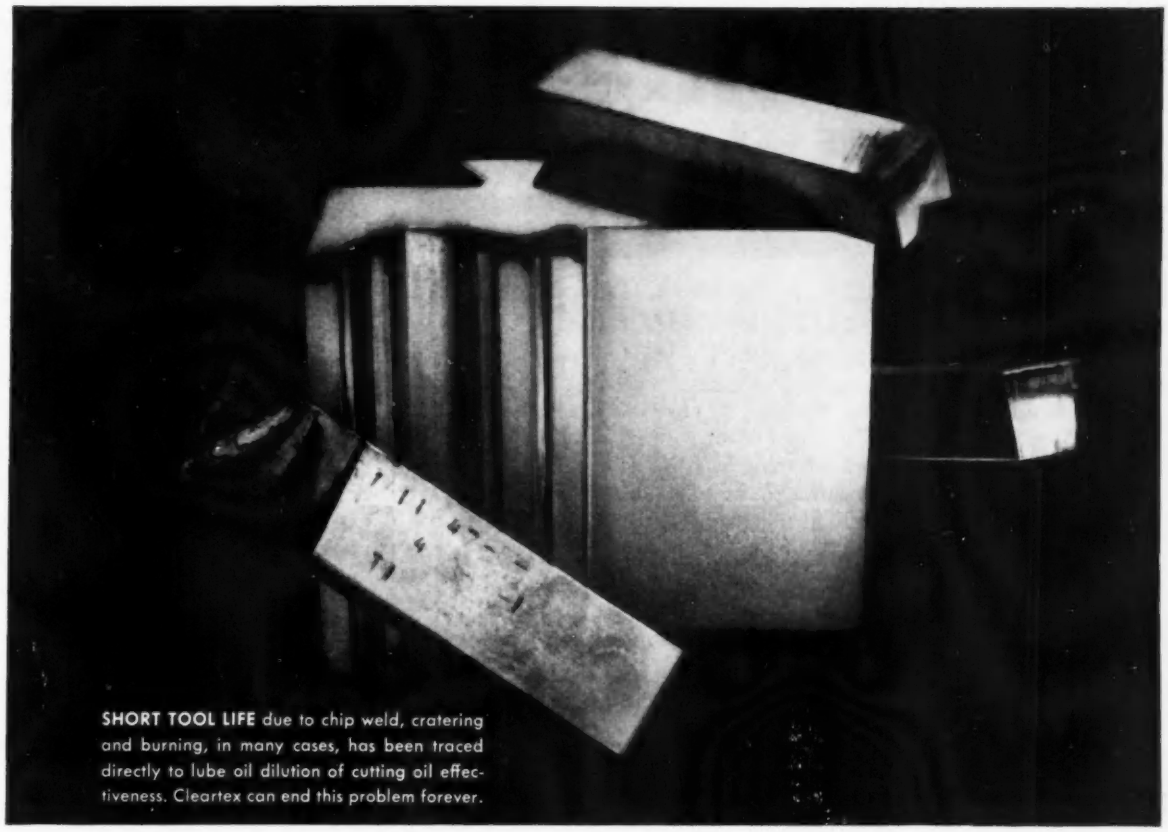


SHORT TOOL LIFE due to chip weld, cratering and burning, in many cases, has been traced directly to lube oil dilution of cutting oil effectiveness. Cleartex can end this problem forever.

Diluted cutting oil shortens tool life drastically

Lubricating oil is probably leaking into the cutting oil sumps of your automatic screw machines as you read this. Current research proves that this is happening in 70% of all the automatics in use today! And where it happens, it shortens tool life by as much as 50%—even 70%. On top of this, the cost of extra regrinds, lost production during tool changes, and excessive scrap production is putting a premium on screw machine operation in too many shops.

Look for these symptoms. One sure sign of dilution is the need for frequent refilling of the lube oil sump. If you are using an ordinary lube oil, this dilution will create two additional—and more costly—symptoms: excessive scrap production and frequent regrinds. Now you can eliminate these forever with the

TEXACO CLEARTEX CURE

The exceptional chemical stability and load-carrying ability of Texaco's Cleartex series make them equally suitable for use as cutting oils, lubricants or hydraulic fluids. All you have to do is use them for both cutting *and* lubrication. With Cleartex in *all* your sumps, you'll find cutting oil dilution will stop and screw machine production cost will drop substantially.

Write today for your copy of Texaco's helpful new booklet "Cleartex in Automatic Screw Machines"...and contact your local Texaco Lubrication Engineer for an authoritative survey of your automatics. Just call the nearest of the more than 2,000 Texaco Distributing Plants, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y. Dept. AI-21.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

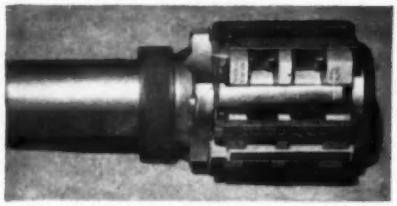
WHY MICROHONING* TOOLS ASSURE

ECONOMY — PRECISION — PRODUCTION

COST FACTORS (labor, maintenance, scrapped parts, productivity, etc.) DETERMINE MACHINE TOOL EFFICIENCY.

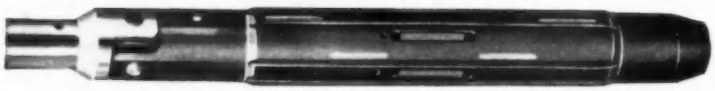
To Minimize These Cost Factors, Micromatic has developed Microhoning tools that offer a new concept in metalworking. This concept (known as the Microhoning process) assures controlled abrading, efficient stock removal, accurate generation of geometry and size, and produces uniform, functional surface finishes.

Because Microhoning removes inaccuracies of preceding operations, it is usually the final stock removal operation. Therefore, Microhoning tools are designed and applied to produce high precision, assure a minimum of scrap and protect the user's investment in previous processing operations.



New! Tru-Float tool has a universal joint within the abrading unit. This design provides maximum accuracy and float, uniform abrading and surface finish, less wear of abrasives, retention of original bore location, and minimum stock removal to correct inaccuracies.

Micromold assemblies have plastic or soft metal shells that minimize tool wear and protect the edges of abrasive sticks from the harsh dressing action of extremely rough bores. This abrasive stick design eliminates many parts previously required to hold abrasives and expand the tool.



Tool designed for Microhoning tandem bores has plastic guides between banks of abrasives to stabilize the tool as it passes over bore interruptions.

Because use of the proper tool is so important, Micromatic designs Microhoning tools to suit the individual work piece, and integrates tool design with machine and fixturing to provide the ultimate in operating efficiency.

**Registered U.S. Pat. Off.*

MICROMATIC HONE CORP.

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ON OUR WASHINGTON WIRE

Defenders of foreign aid concede they have a tough fight on their hands to get Congress to approve the whopping $3.9 billion the White House is asking for the 12 months starting July 1. Opposition is stronger than ever before. Protest mail to members of the Senate and House is running at record levels.

The Pentagon's confession that it wants to sell or dump $60 billion of surplus equipment comes just as Congress is examining the new Defense Dept. bid for $41 billion for fiscal 1960.

Most of the surplus equipment, according to senators who have looked into the problem, is obsolete and deteriorated. Among the items: Planes, tanks, ships, bulldozers, electronic equipment, footwear, small arms, ammunition.

Trouble is, the Army, Navy, and Air Force have a built-in tendency to overstate their needs. Based on past performance, about $9 billion worth of military equipment bought each year will rot in warehouses and on parking lots.

The U. S. Air Force Academy —built at a cost of over $133 million—is without an airfield, although it boasts such vital military items as gymnasiums with swimming pools, basketball courts, a plush officers club, an 18-hole golf course, and a $5 million social center with two ballrooms and four gardens.

Higher taxes are coming. Here's why: The Government continues to take in less money than it spends. The cold war is becoming more expensive.

SHORTIES

To insure safe airline operation, more than 50,000 simulated "flights" were made in the fuselage section of a jet transport.

•

Employes at one steel company are provided with 55 different types of eye protection.

•

While the cost of living doubled between 1940 and late 1958, average hourly earnings of steel workers increased 3½ times, according to Government figures.

•

A record low of 3.21 accidents per million man-hours occurred in steel plants in 1958. This compares with 3.48 in 1957, the previous record year.

•

Shipments of finished steel products from steel mills last year totaled 59,914,433 net tons, a 25 per cent drop from the 79.9 million tons shipped in 1957.

•

The total number of steel company stockholders rose to a record high level last year and crossed the million-mark for the first time. At the end of 1958, the figure was 1,026,825, an increase of nearly 39,000 since 1957.

•

Employment costs for hourly employes in the iron and steel industry reached a record high of $3.513 per hour worked in 1958, despite the decline in industry sales.

•

Passenger cars were involved in almost 80 per cent of the fatal accidents and 87 per cent of nonfatal accidents on U. S. highways in 1958.

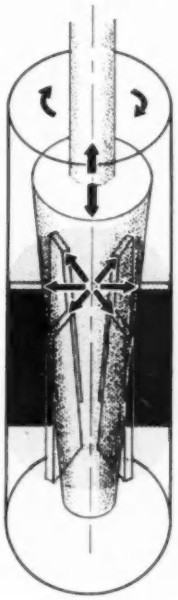
•

During 1958, drivers under 25 (14 per cent of all licensed drivers) were involved in 27.1 per cent of all fatal accidents and more than 20 per cent of nonfatal crashes.

HOW MICROHONING* TOOLS PROVIDE

ECONOMY—PRECISION—PRODUCTION

When a precision stock removal process minimizes cost factors (labor, maintenance, scrapped parts, etc.) then volume production at lower cost per piece is possible. Here's how the distinctive design and performance of Microhoning tools provide all three—economy, precision and production.



EFFICIENT OPERATION

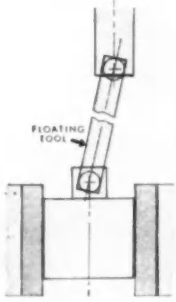
Micromatic expands, rotates and reciprocates the abrading tool in the bore. Through this controlled combination of pressure and movements, abrasives are self-dressing for effective and continuous cutting action. Long abrasive sticks are evenly spaced around the tool to keep it stable. They effectively bridge surface irregularities and generate a geometrically true cylinder.

REDUCES OPERATOR COSTS

Micromatic "Adjusting Heads" give operator complete and positive control of tool expansion. Or, automatic controls can be used to perform all tool adjustment and gaging. They assure accurate duplication in every part produced.

MINIMUM MAINTENANCE

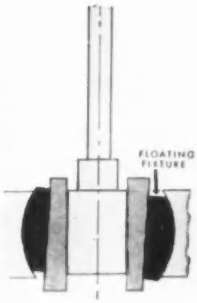
Micromatic tools are designed for durability, especially at all stress points and joints. Plastic or soft metal holders prolong abrasive life, greatly reduce tool wear.



MAINTAINS ORIGINAL BORE LOCATION

Micromatic either floats the tool or the work holding fixture so tool and work piece can automatically align themselves. This assures cutting-unit rotation coincides with neutral axis of bore.

WRITE FOR LITERATURE



Micromatic produces tools best suited to the production of individual work pieces. And properly integrates the tool with machine and fixturing for peak productivity at lowest cost per piece produced.

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WITH A DEVILBISS PAINT HEATER

DEVILBISS HOT-WATER PRINCIPLE

Diagram shows how the DeVilbiss hot-spray method uses water as a temperature equalizer. The heating action of forced hot-water circulation is fast, yet gentle and safe. Uniform paint temperatures are maintained without "hot spots" or the danger of thermal override. Paint can never be overheated to cause scorching, hardening, or discoloration.

Circulating hot water heats paint gently, quickly, and keeps it hot all the way to the gun

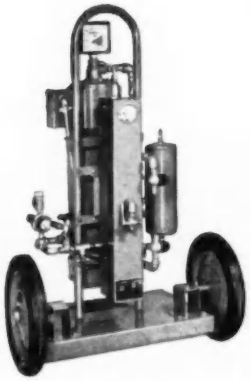
Paints, like certain foods, scorch quickly—can't stand an intense, direct-heat.

The DeVilbiss Paint Heater with its water jacket, like your double boiler, is the only method that applies a gentle heat to eliminate "hot spots." There is no possibility of overheating or hardening paint, because the water serves as a temperature equalizer between the heat source and the paint.

An exclusive heat-jacketed hose, with circulating hot water, maintains the proper temperature of the paint right up to the spray gun.

Only water is recirculated in a DeVilbiss system—there is no need for repeated circulation of paint in order to reheat it.

For hot spray at its best, check the yellow pages of the phone book for your DeVilbiss representative and ask for a demonstration of the DeVilbiss Paint Heater—the safe, sure way to improve painting quality, reduce overspray, apply heavier coats, and make the job of application easier.

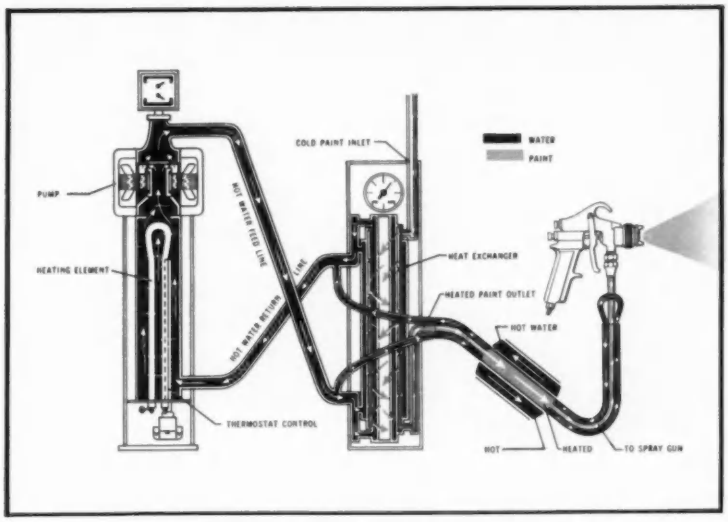


DeVilbiss Portable Paint Heater lets you take hot spray to the job. Hooks into any conventional spray outfit. Units for production-line installation also available.

YOU CAN'T SCORCH PAINT!

DIRECT-HEAT PRINCIPLE

Exposing paint directly to the metal heating medium—as shown in diagram representing ordinary paint heaters—results in higher temperatures at the point of heat transfer. And although the heating element may be thermostatically controlled, when the paint stops circulating, thermal override often causes scorched, hardened or discolored material.



Water is heated in compact electric unit (left), and circulated through heat exchanger (center). Paint rapidly reaches a controlled temperature in the exchanger, as it spirals through a passage surrounded by hot water. Water-jacketed hose (right) keeps the paint hot as it flows up to the gun.

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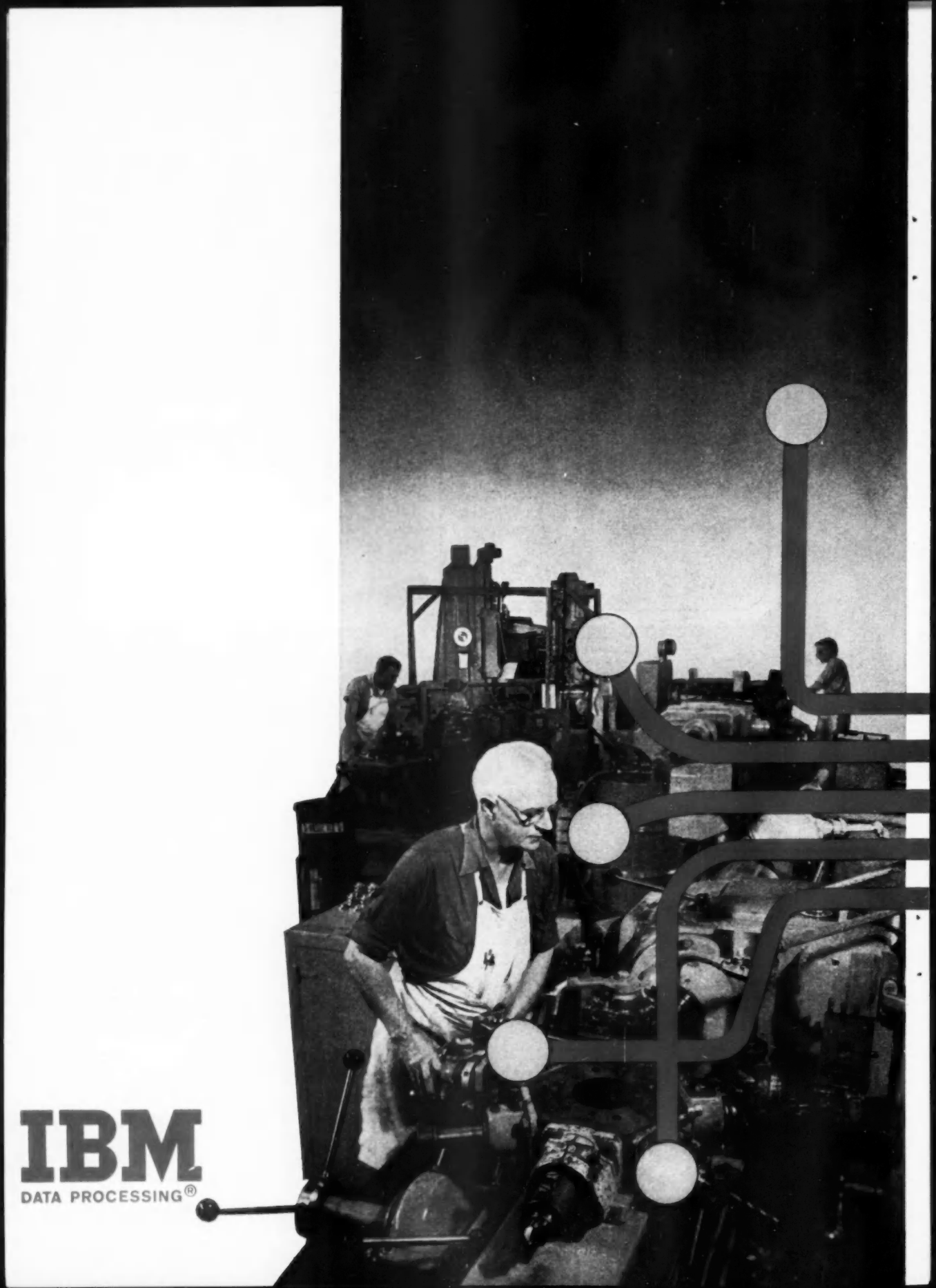

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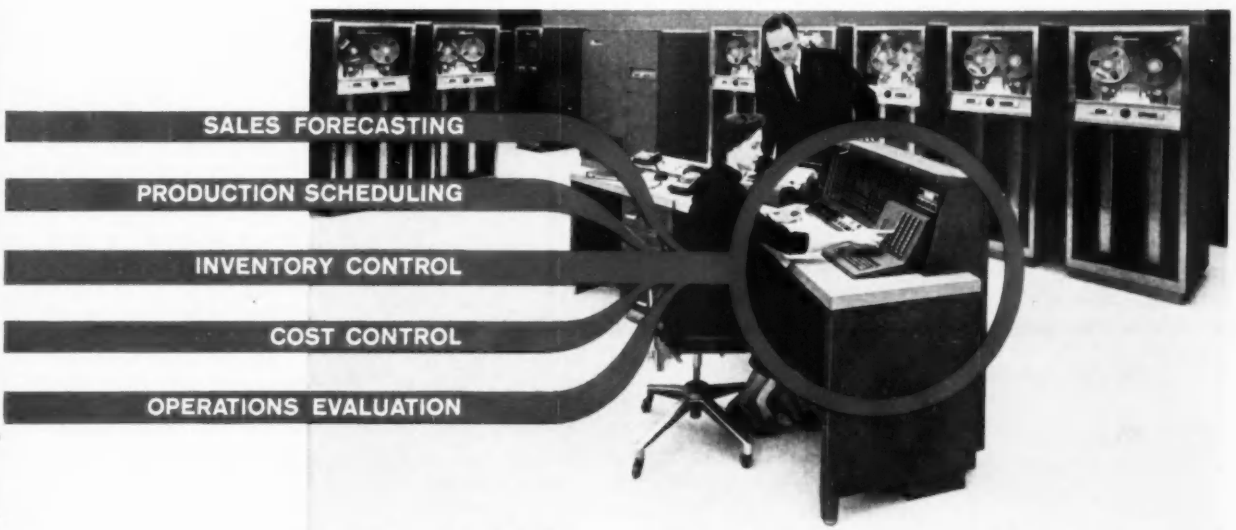


Now . . . through IBM data processing . . . large and small companies can control manufacturing operations with precision. Manpower, materials and machines are used where you want them, when you want them, in quantities you want for the optimum scheduling.

With new abilities to record, process and evaluate current data, your manufacturing management can base requirements directly on market demands. Decisions are swiftly reflected all the way back through assemblies to parts and raw materials, manpower and machines.

Applied to inventory control, production scheduling, sales forecasting, and cost control, this new method brings tighter control and substantial operating savings. Now, new techniques such as job shop simulation become practical and enable you to look into the future with a minimum of trial and error.

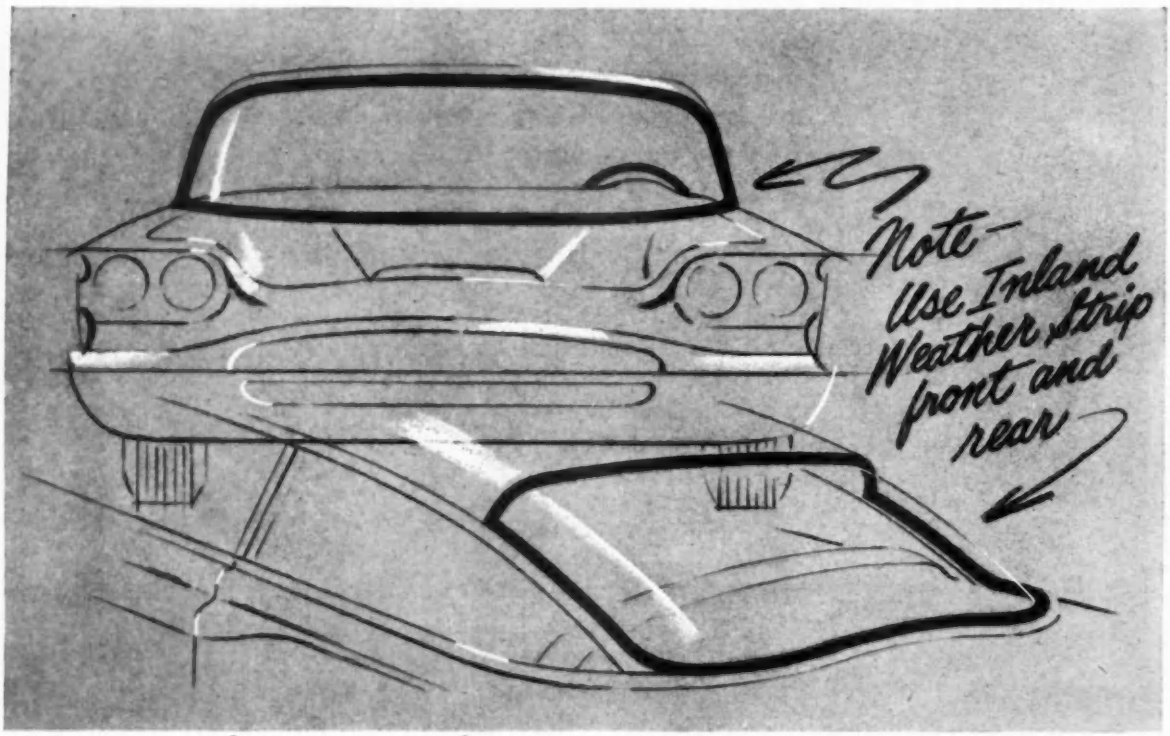
Typical results of the application of this IBM method: One manufacturer does a complete monthly material requirements breakdown for the next twelve months in just twelve hours; service parts production is calculated in just one hour; perpetual inventory updated on a daily basis in one hour. Other controls include weekly machine load forecast and summary inventory evaluation reports.

IBM Data Processing systems may be purchased or leased. To get the facts, call your local IBM representative.

Circle 138 on Inquiry Card, for more Data

FREEDOM

TO DESIGN FOR A FUTURE THAT SPARKLES



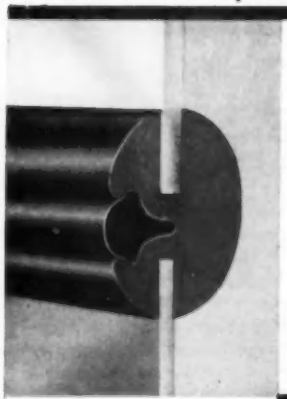
Transportation Industry

Railway Equipment

Over-the-road Equipment

Marine Applications

Commercial Structures



Filler Strip zips into locking channel, compressing the entire strip into permanent, leak-proof seal.

The wonderful versatility of Inland Self-Sealing Weather Strip allows complete design freedom with glass of any size or shape for modern vehicles.

In any weather, Inland Weather Strip never leaks. Shocks or vibrations have no effect on its weather-proof qualities. Inland's filler strip keeps both glass and body panel under compression—and lowers costs, too.

Important savings are possible in design, construction and installation. Inland Self-Sealing Weather Strip needs no special cement, binders, or clamps. One man can install it easily and quickly. Replacement takes minutes.

Make your designing easier with Inland Self-Sealing Weather Strip—available in standard sizes, or made to your specifications. Write, wire, or phone for detailed information.

INLAND MANUFACTURING

INLAND

SELF-SEALING WEATHER STRIP

Inland Manufacturing Division, General Motors Corporation, Dayton, Ohio

Circle 139 on Inquiry Card, for more Data

you can smile when its stainless

UNILOY
STAINLESS STEELS

No frowns . . . just smiles when protective trim is made from high strength stainless steel. Its solid quality . . . all the way through . . . and car life beauty will gleam through years of owner pride and satisfaction. Uniloy Stainless Steel provides these qualities—plus ease of fabrication, rolled to your exact specifications.

UNIVERSAL CYCLOPS
STEEL CORPORATION
BRIDGEVILLE, PA.

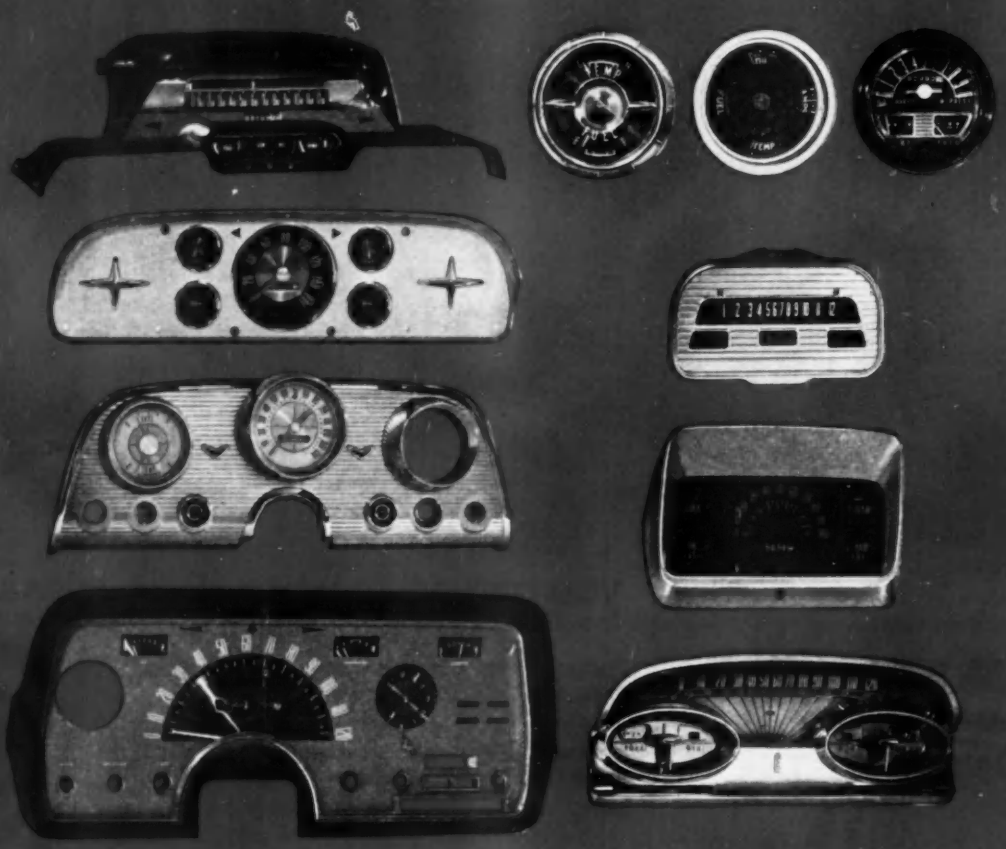
STAINLESS STEELS • TOOL STEELS • HIGH TEMPERATURE METALS

Circle 140 on Inquiry Card, for more Data

KING-SEELEY

INSTRUMENTATION

The Quality Standard For 1959



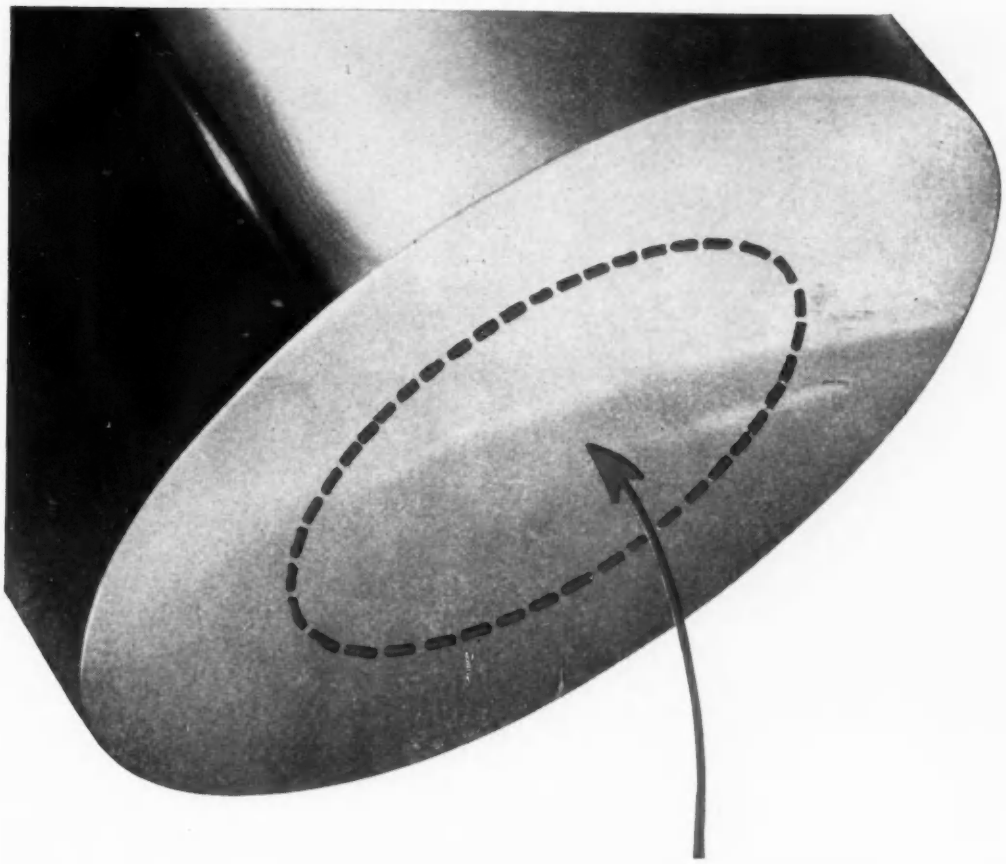
KING-SEELEY CORPORATION

ANN ARBOR, MICHIGAN

KS

8242

Circle 141 on Inquiry Card, for more Data



Here's where hollow parts makers can find new savings

IF YOU'RE boring out bar stock to make hollow parts, you can save money, time and steel. Start with Timken® seamless steel tubing because:

1. YOU SAVE THE COST OF DRILLING; the hole's already there. Finish boring becomes your first production step.

2. YOU SAVE MACHINE TIME by eliminating this costly, original boring operation. You free screw machine capacity for other jobs, increase machining stations *without* adding machines.

3. YOU SAVE STEEL BY WASTING LESS and using more of the steel you buy. You get more parts per ton of steel, because there's less metal to hog out.

And you get finished parts of better quality from Timken seamless steel tubing. We forge a solid round over a mandrel, thoroughly working the metal inside and out. This rotary piercing operation gives seamless tubing its fine forged quality and unvarying spiral grain flow. Precise control of temperature and piercing speed helps assure you of uniform quality from tube to tube, heat to heat, order to order.

To save even more steel, have our engineers recommend the one most economical tube size for your hollow parts job. We'll guarantee it to clean up to your finish dimensions. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN *Fine Alloy* **STEEL**

TRADE-MARK REG. U. S. PAT. OFF.

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING

with Cleco's 3-in-1 drill-screwdriver-nut runner

With the Cleco 10 Series Drill-Screwdriver-Nut Runner you save money because:

1. *You can reduce tool inventory.* The remarkable interchangeability features of these tools permit gear trains, motors, handles, and chucks to be interchanged. With a limited number of extra parts this tool can be made up with gear reductions for various speeds as a screwdriver-nut runner or drill.
2. *Cleco 10 Series cost less to operate.* They are equipped with *all new air motors.* Motors that are more powerful, yet actually require less air per h.p. output.
3. *They operate longer with less wear.* Cleco's new, non-friction, roller-type clutch "slips" when preset torque is reached: eliminates slugging: has unequaled torque holding ability. Friction-free clutch permits longer, *much longer,* periods of maintenance-free operation.

Call ***your Cleco representative for a demonstration tryout. See for yourself how economical, easy-to-handle, well-balanced, long-life Cleco 10 Series Drill-Screwdrivers-Nut Runners really are.***

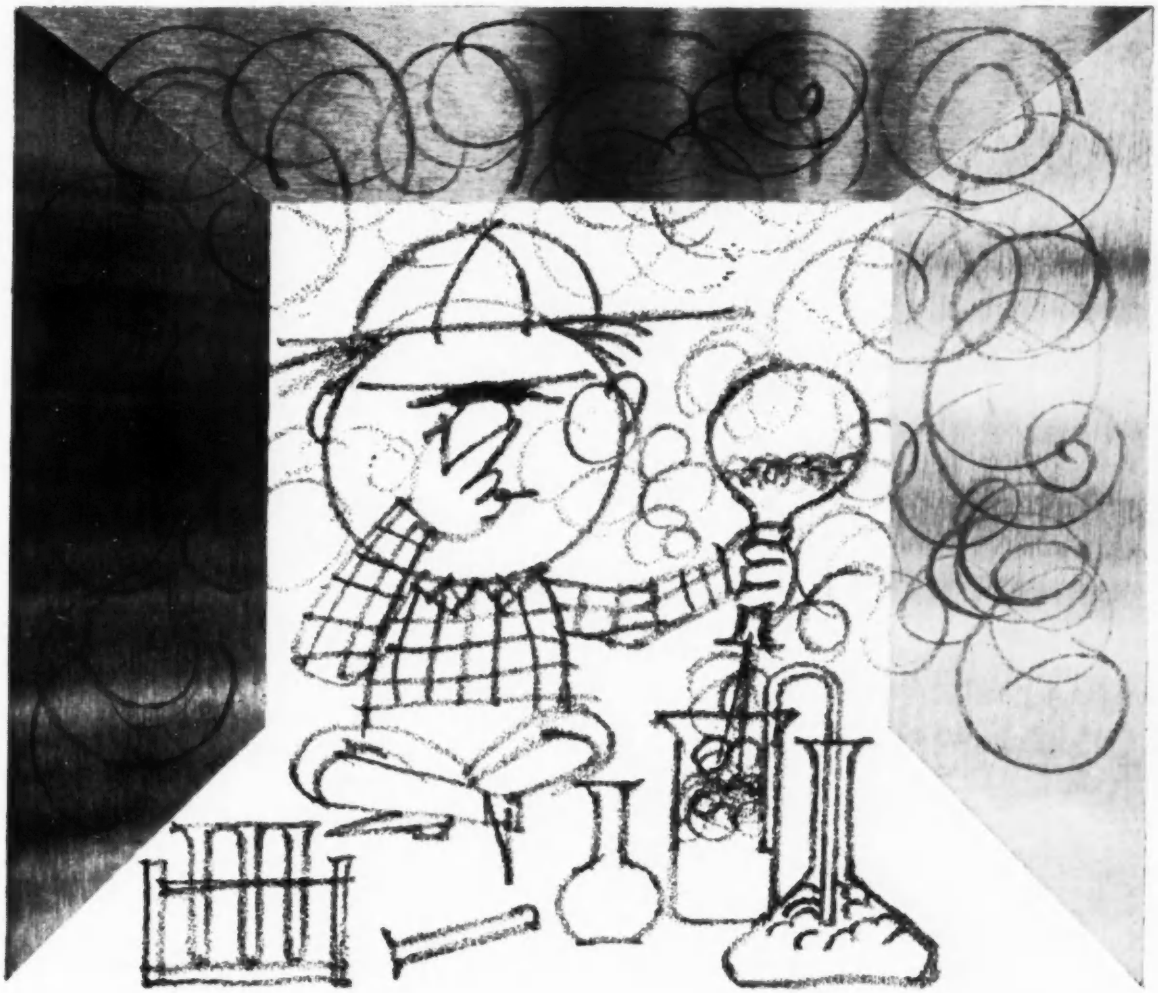
CLECO AIR TOOLS

DIVISION OF REED ROLLER BIT COMPANY

P. O. Box 2119 • Houston 1, Texas

IN CANADA: Cleco Pneumatic Tool Company of Canada, Ltd., 927 Millwood Road, Leaside (Toronto), Ontario

Circle 143 on Inquiry Card, for more Data



STAINLESS STEEL SAYS "NO" TO CORROSIVE FUMES!

Stainless steel puts up strong resistance to fumes that would discolor and corrode other metals. And designers know, too, that stainless steel resists rusting, denting and scratching; it doesn't peel, is extra strong—and beautiful! Keep these qualities in mind when you want your designs perfectly (and enduringly) realized. And remember, the very *best* stainless steels are made with Vancoram Ferro Alloys.

Producers of alloys, metals and chemicals

VANCORAM BRAND

VANADIUM CORPORATION OF AMERICA

420 Lexington Ave., New York 17, N. Y.
Chicago • Cleveland • Detroit • Pittsburgh

Circle 144 on Inquiry Card, for more Data

FORD INDUSTRIAL ENGINES

. . . first choice when dependability and service count most!

Exploration . . . drilling . . . production . . . almost any oil field job can be handled more efficiently and more dependably with a Ford Industrial Engine.

Why? Because Ford engines offer many advanced features that help provide more horsepower per pound of engine weight than ever before possible. Compare these Ford advances for yourself: *Short Stroke design* that cuts friction and wear . . . *rigid Deep-Block construction* that minimizes vibration, extends bearing life . . . and *overhead-valve design* for greater operating efficiency.

Ford engines range from 134 to 534 cubic inches, including 2 ultra-modern and compact Diesels and 3 Super Heavy Duty V-8's. All are available as engine assemblies or power units; gasoline models can be adapted to LP- or natural-gas fuel.

And remember, too, no other manufacturer can match Ford for service. Wherever you go, there's a Ford Dealer to give you service *when you need it!*

Ford
INDUSTRIAL ENGINES
AND POWER UNITS

See this Geo. E. Failing rig at the FORD EXHIBIT—Tulsa Oil Show

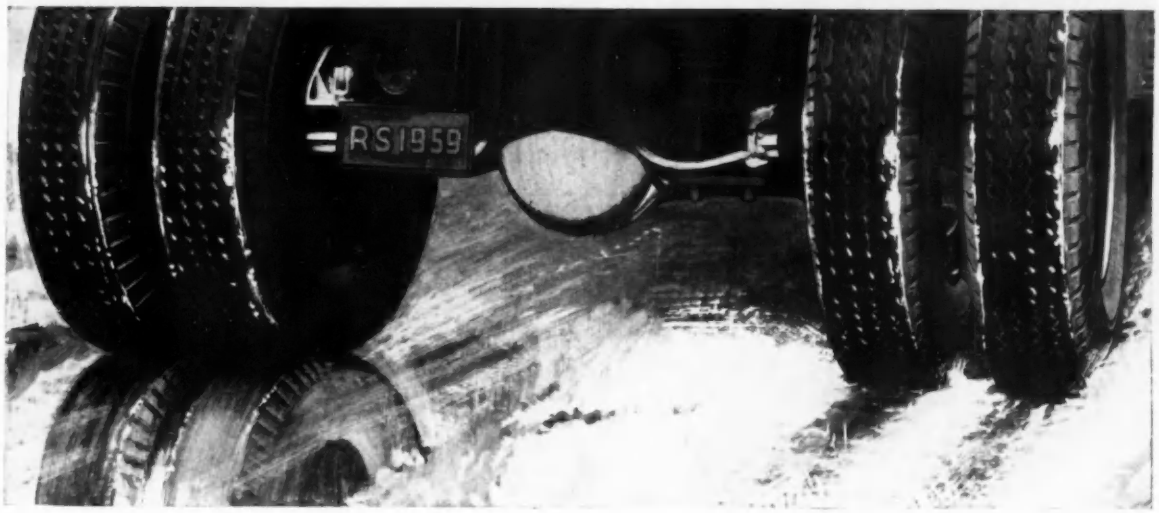
INDUSTRIAL ENGINE DEPARTMENT • FORD Division, FORD MOTOR COMPANY
P. O. Box 598, Dearborn, Michigan

See you at the OIL SHOW • Tulsa • May 14-23 • Booth 6-E

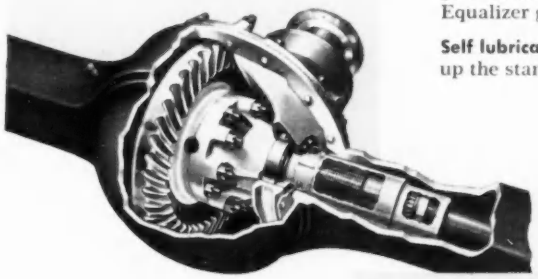
Circle 145 on Inquiry Card, for more Data

NEW ROCKWELL TRACTION EQUALIZER...

puts the action where there's traction!



Available with Timken-Detroit® Axles for safer, surer performance... on or off the highway!



Applies driving force to wheels with best traction. The Rockwell Traction Equalizer provides a substantial increase in tractive effort to the wheel with the best road adhesion. It is effective on a vehicle even if one pair of the driving wheels has *no* traction!

Safer, surer operation. A truck equipped with the Rockwell Traction Equalizer is easier to control on curves, slippery pavement and soft ground. The tendency of a vehicle to swerve when one wheel suddenly loses traction is eliminated because wheel spinning is reduced.

Constant actuation. The Rockwell Traction Equalizer doesn't depend on the driver to start it working. It is effective whenever one wheel has the tendency to turn faster than the other.

Tailored for effectiveness. With multi-drive axle vehicles, each axle may be equipped with Traction Equalizer units. No matter where your vehicles operate—on or off the highway—the Rockwell Traction Equalizer gives your vehicles better traction.

Self lubricating. The Rockwell Traction Equalizer automatically picks up the standard axle lubricant and works it through the unit.

Less maintenance. The Rockwell Traction Equalizer normally requires no maintenance between axle overhaul periods. It also cushions heavy impact loads upon tires, shafts and gears.

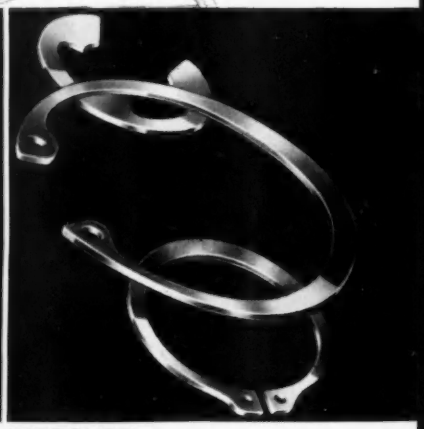
Another Product of... **ROCKWELL-STANDARD CORPORATION**

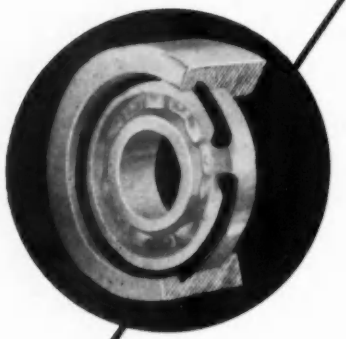
ROCKWELL R STANDARD

Transmission and Axle Division, Detroit 32, Michigan

Circle 146 on Inquiry Card, for more Data

ONLY RAMCO MAKES BOTH TYPES OF MODERN RETAINING RINGS





UNIQUE

SpirOlox

A time-tested Ramco design; full-circle 360 degree retaining ring opens up unlimited possibilities for improved design and economies in thousands of new or present products.

- √ Uniform wall allows installation with minimum clearance.
- √ Two turn, full-circle design eliminates gaps.
- √ No special tools needed for installation or removal.
- √ No tooling needed for prototypes.
- √ Develops "friction lock" under load.
- √ Single or multi-turn designs.
- √ Always uniform in quality.
- √ Special designs for high speeds or tolerance stack-up problems.

IMPROVED

CircOlox

The answer to easy, lightweight, low cost assemblies and reduced manufacturing costs. Made in a variety of types and sizes for the smaller shaft or housing diameters.

- √ "Deep-groove" design permits maximum thrust with minimum weight.
- √ Easily installed or removed.
- √ Available in a variety of materials.
- √ Wide choice of finishes.
- √ Always uniform in quality.
- √ Meets Government and Industry Standards.

Retaining Rings by Thompson Products

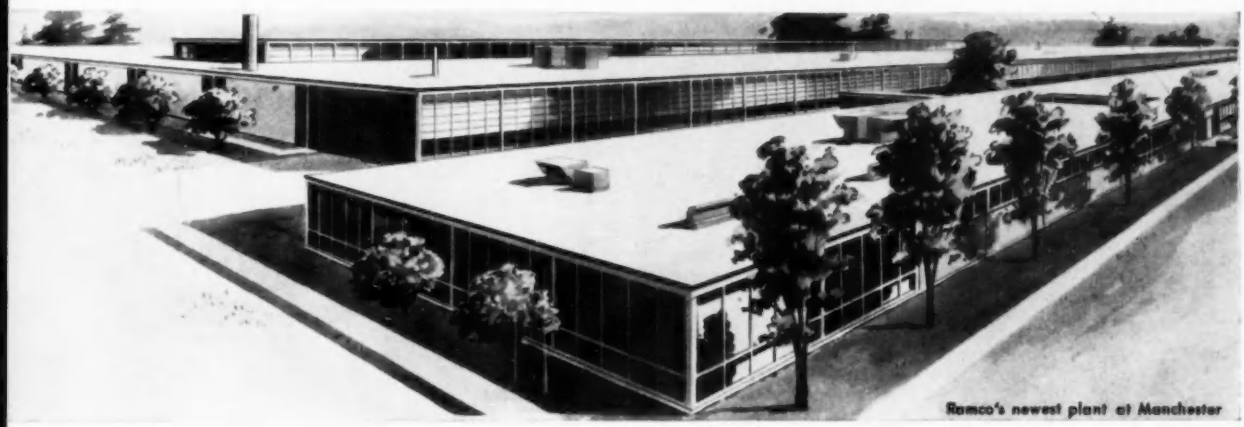
Copyright 1959, Ramsey Corporation 544

another product of **Thompson Ramo Wooldridge Inc.**

ASSEMBLED COST? APPEARANCE? PERFORMANCE?

WHAT IS YOUR MAJOR FASTENER PROBLEM?

If it is assembled cost, Ramco retaining rings can give you the one best answer



Ramco's newest plant at Manchester

To cut assembled cost . . . thousands of manufacturers have adopted either Ramco Spirolox or Circolox designs. Whichever of these modern retaining rings provide the one best answer to the problem . . . Ramco engineers can design and the world's most modern retaining ring plant can deliver!

Whatever it takes . . . rings designed from standard or special materials . . . designs for quick, easy assembly or with special tolerances . . . you can depend on Ramco to deliver The One Best Answer. Only Ramco can supply retaining rings in a complete range of sizes from 1/16 inch to 40 inches in diameter.

In addition to cutting assembled costs . . . you can depend on Ramco Spirolox and Circolox to solve problems of appearance and performance. As a Ramco Spirolox-Circolox customer you have the engineering know-how of one of the nation's great organizations at your service to provide you with the ONE BEST ANSWER TO YOUR RETAINING RING PROBLEMS! Why not mail the coupon today . . . let us help you with any of your problems.

RAMCO DIVISION

automotive group TRW

Thompson Products Ramco Division
Box 513, Dept. H, St. Louis 66, Mo.
Send latest Engineering and Price Catalogs of Spirolox and Circolox Retaining Rings.

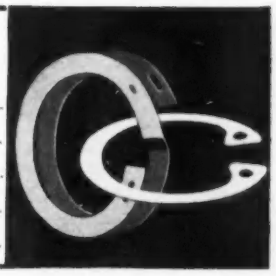
Name.....Title.....

Company.....

Address.....

City.....Zone.....State.....

Samples Wanted: Spirolox ☐ Circolox ☐ Size.....

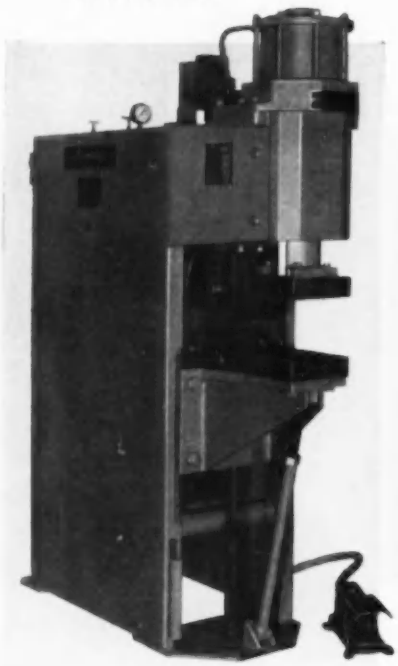


Circle 147 on Inquiry Card, for more Data

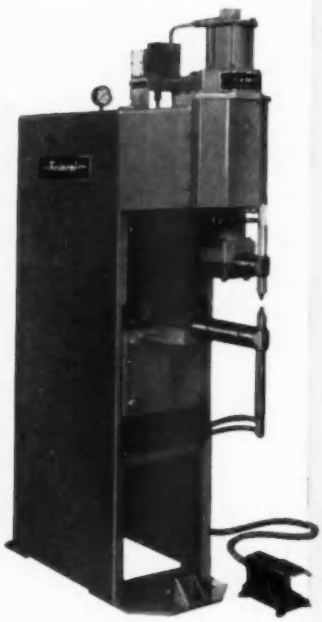
Introducing...

FEDERAL'S NEW TRIM-LINE PRESS WELDERS

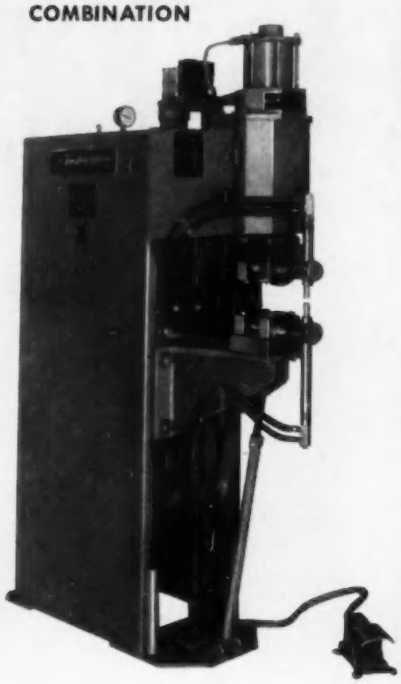
PROJECTION



SPOT



COMBINATION



Available from stock in four sizes in capacities of 30 to 500 K.V.A.

Completely new . . . these advanced design trim-line press welders will give you maximum production in a minimum floor area. What's more their compact, simplified design assures easier operation, less maintenance and ready accessibility.

Designed and built by Federal, one of the largest and most experienced resistance welder manufacturers, these new welders are available from stock as spot welders with horns, projection welders with platens, or combination spot and projection welders. Each type is available in a full range of standard throat depths, welding forces and transformer sizes.

Many standard automatic welding attachments are available to increase production with these standard machines.

Listed below are some of the features. For more information get in touch with the Federal representative nearest you. Ask for Bulletin P-59 and Special Tooling Bulletin AWA-59.

COMPLETELY ALL NEW DESIGN FEATURING:

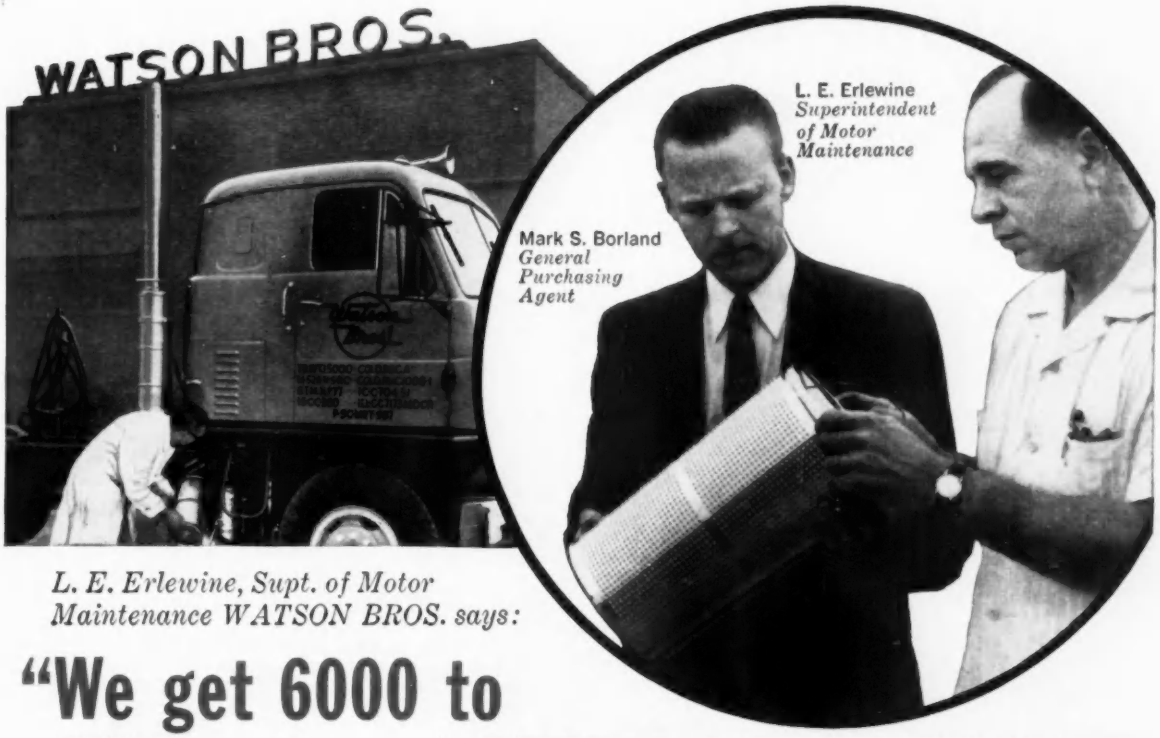
- **New One Piece Frame** . . . stronger, less floor area, greater accessibility.
- **New Anti-Friction Slide** . . . hardened and ground slideweighs —eight anti-friction roller mount gives maximum stability —permanently lubricated rollers—simple adjustment.
- **New Steel and Copper Lower Arm** . . . minimum deflection—easier to adapt for special tooling.
- **Stock Models** . . . all components built for stock, quick delivery.
- **No Price Increase** . . . superior design at low cost.

Federal / Warco

THE FEDERAL MACHINE AND WELDER CO. • WARREN, OHIO

AFFILIATED WITH BERKELEY-DAVIS, INC., DANVILLE, ILLINOIS, MANUFACTURERS OF AUTOMATIC ARC WELDING EQUIPMENT

Circle 148 on Inquiry Card, for more Data



L. E. Erlewine, Supt. of Motor Maintenance WATSON BROS. says:

"We get 6000 to 8000 miles of EFFECTIVE FILTRATION from a single DIESELPAK"*

Here's powerful proof that superior performance COSTS LESS than ineffective substitutes

Only LUBER-FINER DIESELPAK, with its *exclusive* specially processed media, removes oil contaminants *effectively*—FAR LONGER THAN ANY SUBSTITUTE PACK.

DIESELPAK—designed expressly for use with H.D. detergent compounded oil—removes not only injurious suspended solids, but also colloidal impurities (often more destructive) *without affecting the additives.*

Thus LUBER-FINER DIESELPAK

1. COSTS LESS than ineffective substitutes because it gives MORE MILES of *effective filtration.*
2. Also ADDS THOUSANDS OF MILES to ENGINE AND OIL LIFE because its exclusive engineered protection CLEANS OIL FASTER AND KEEPS IT CLEAN LONGER.

STANDARD AND OPTIONAL EQUIPMENT—On leading Diesel Trucks, Tractors and Stationary Engines.

* A typical statement of many users, engineers, and original equipment manufacturers on file.

VISUAL PROOF why DIESELPAK is The Standard of the Industry

Positive end seals prevent the oil from by-passing. The oil is filtered through the patented media of the DIESELPAK which removes colloidal particles and other contaminants without adversely affecting the additives.

The oil then passes through several layers of protective fibrous material which is scientifically engineered to positively prevent media from migrating into the engine.

World renowned engineered protection is enjoyed only by the users of the genuine LUBER-FINER "DIESELPAK."

Luber-finer

WRITE FOR INFORMATION—how to get MORE MILES of effective lubrication at LESS COST. Dept. A-3.

LUBER-FINER, INC.
2514 South Grand Avenue, Los Angeles 7, California

Circle 149 on Inquiry Card, for more Data

R/M Friction Material brakes giant welcome wagon on rugged 13,000-mile Maine-Alaska trip

R/M friction material does it again! Proves its dependability . . . withstands brutal doses of temperature extremes, delivers safe, smooth braking power under all conditions.

The giant welcome wagon of the Maine Truck Owners Association containing gifts from the State of Maine to the new State of Alaska was equipped with R/M material on both axles. The 13,176-mile run from Portland to Anchorage, Alaska, encountered extremes of altitude and climatic conditions—the passes of the Rockies, 2 miles high . . . temperatures of 110°F in California to −35°F in a blizzard on the Alcan Highway. Technically recorded data gathered by the truck manufacturer show that the brakes worked perfectly the entire trip.

This is but another example of R/M leadership in friction. R/M has amassed a wealth of knowledge about the behavior of molded, woven, metallic and ceramic friction materials. No matter what your friction problems, R/M has the facilities and technical know-how to help solve them. Take advantage of our pioneering and experience in the design, development and testing of friction materials. Write today for full details . . . learn why R/M is *first in friction!*

Send for your free copy of new Bulletin No. 501—packed with helpful engineering information on friction materials.

R/M FIRST IN FRICTION

RAYBESTOS-MANHATTAN, INC.

EQUIPMENT SALES DIVISION: Bridgeport, Conn. • Chicago 31 • Cleveland 16 • Detroit 2 • Los Angeles 58

RAYBESTOS-MANHATTAN, INC., Brake Linings • Brake Blocks • Clutch Facings • Sintered Metal Products Industrial Adhesives • Mechanical Packings • Asbestos Textiles • Industrial Rubber • Rubber Covered Equipment • Engineered Plastics • Abrasive and Diamond Wheels • Laundry Pads and Covers • Bowling Balls

Circle 150 on Inquiry Card, for more Data

Circle 151 on Inquiry Card, for more Data

BULLARD

"H.B.M., Model 75 is better than any other machine we've ever seen."

This statement by Mr. John Gruber, Plant Foreman of George Hantscho and Company, Inc., Mount Vernon, New York, manufacturers of printing equipment, sums up their experience since installing the Bullard 4" H.B.M., Model 75, in June 1957.

He further states "our presses and paperfolding machines are made to order and each job varies from the one before it. Because of this, we can't use assembly line or mass production techniques."

"The only mass production we have is the machining of holes in cast iron, up to as many as 105 in a side frame. Since we've been using our Bullard H.B.M., Model 75, with BULLARD AUTOMATIC POSITIONING we have not spoiled a single piece due to the malfunctioning of the machine."

Do you know the full story on the Bullard H.B.M., Model 75? If not, it will pay you to call your nearest Bullard Sales Engineer — he'll be glad to give you all the details or write

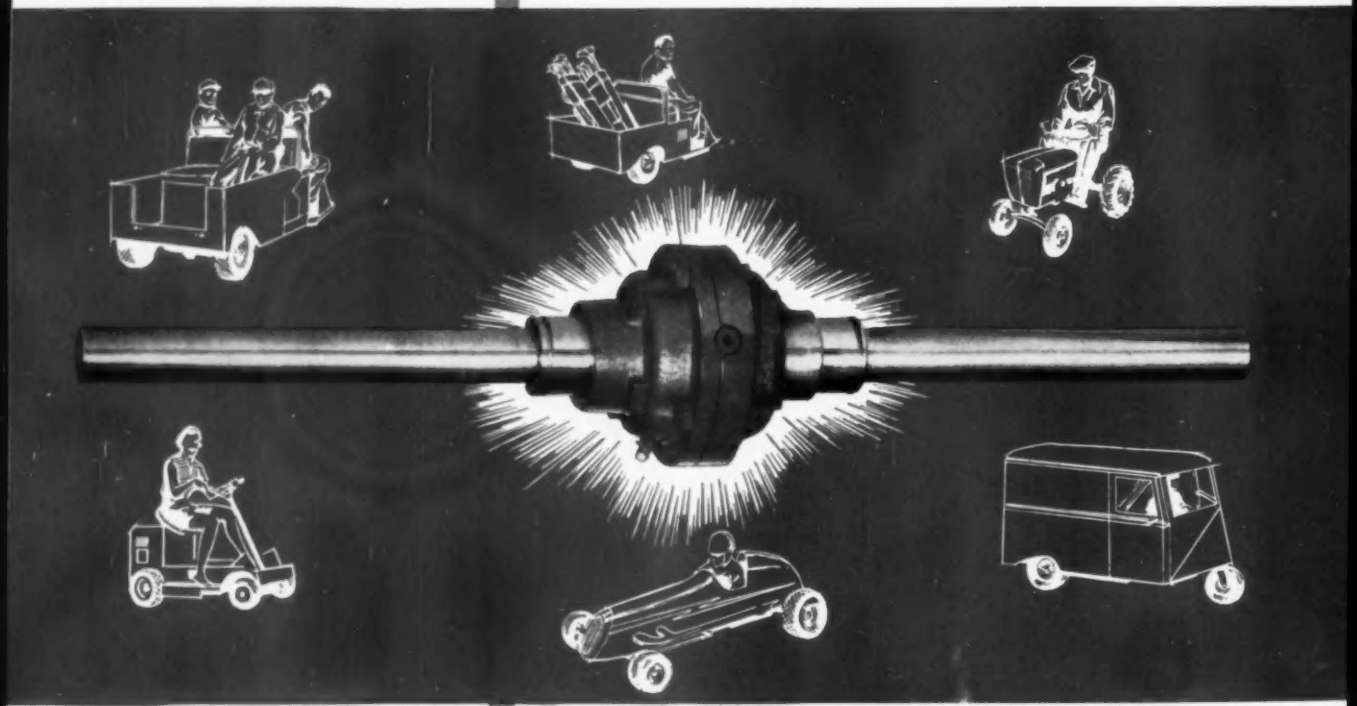
THE BULLARD COMPANY BRIDGEPORT 9, CONN.

NEW

from

WARNER AUTOMOTIVE

Compact, rugged DIFFERENTIAL for SMALL VEHICLE* applications



*APPLICATIONS

- Personnel Cars
- Riding Mowers
- Garden Tractors
- Golf Carts
- Small Delivery Vehicles
- ¼ Midget Race Cars
- Miscellaneous Differential Requirements

Now available in large or small quantities

Here is a compact, new differential assembly with rugged reliability engineered into every detail. Designed especially for small vehicle applications, it is rated at 10 hp . . . has provisions for mounting sprocket, pulley or gears . . . and is furnished with hubs for anti-friction bearings. Hardened alloy steel differential gears and pinions have automotive type cut teeth. Alloy steel axle shafts are readily machinable —or can be furnished machined to your specifications.

Unit is equipped with an Alemite grease fitting for convenient lubrication when mounted externally—or can be run in oil when mounted inside a differential case.

Built to Warner Automotive's traditionally exacting quality and performance standards, this new unit may be the answer to your small vehicle differential requirements. Write for full details, without obligation.

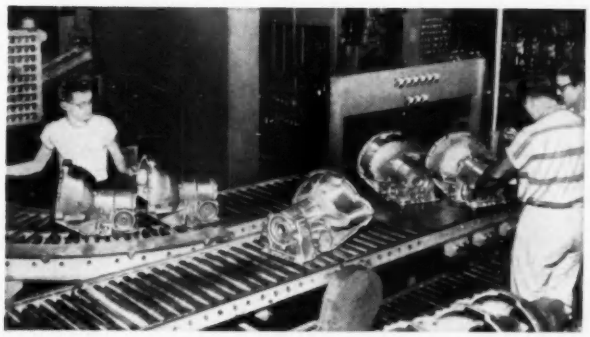
WARNER AUTOMOTIVE B-W BORG-WARNER

WARNER AUTOMOTIVE

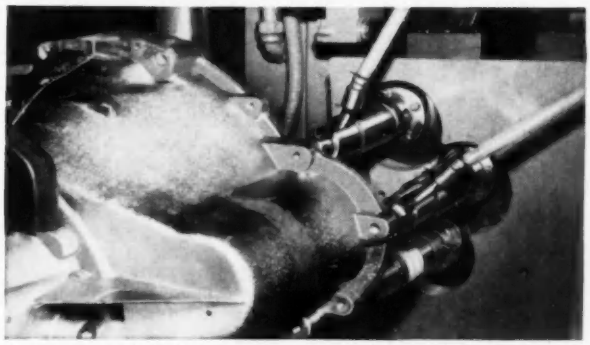
Warner Automotive Division, Borg-Warner Corporation

AUBURN, INDIANA

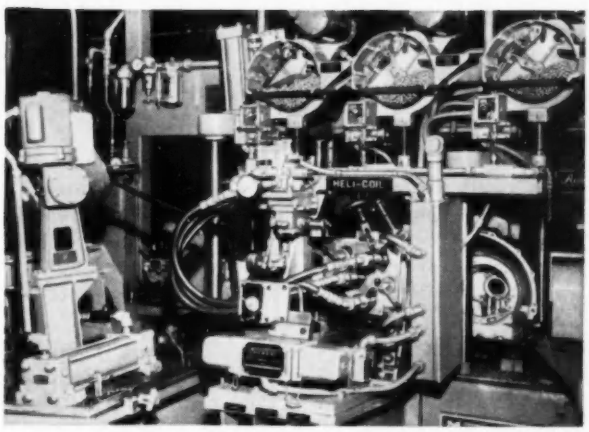
FORD Aluminum Transmission Housings get permanent steel thread strength with *HELI-COIL*® Screw-Thread Inserts



Aluminum housings are drilled and tapped, then transferred to *Heli-Coil* inserting machines on Ford assembly line. Each machine automatically and simultaneously installs three 5/16-18 Screw-Thread Inserts in seconds.



Inserts are picked up by air-powered rotating mandrels and wound into housing.



Hoppers over the inserting machine have 1500 insert capacity. Air jets speed inserts as they slide through nylon tubes into the inserting tools. Unit was specially designed and built by *Heli-Coil* Corporation as an integral part of the Ford production line and is the first completely automatic inserting machine to have all operations co-ordinated into a single unit.

Automatic inserting machines speed installation on production lines

Tapped threads in the starter mounting pad of this new Ford aluminum transmission housing would have been too soft to resist wear caused by vibration, impact and occasional dismantling for service.

Ford Motor Company uses one-piece *Heli-Coil* Screw-Thread Inserts for greater thread strength under dynamic and static loading. With these precision-formed steel wire threads, there's *no* chance of thread wear or stripping for the life of the transmission.

Heli-Coil engineers designed and built high-speed equipment to install the inserts *automatically* right on the transfer line. There's no production slowdown.

Heli-Coil Inserts

- allow repeated assembly and disassembly without loss of thread strength
- hold screws or studs securely under vibration and impact
- prevent thread wear, stripping, corrosion, galling and seizing
- can be used in standard proportion bosses without need for redesign
- are available in a complete range of U.N.C. and U.N.F. thread sizes as well as spark plug and pipe thread series
- save assembly time, space, weight and cost.

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DANBURY, CONNECTICUT

HELI-COIL CORPORATION
3204 Shelter Rock Lane, Danbury, Conn.

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41 Kipling Ave., S., Toronto 18, Ont.

←——— Circle 152 on Inquiry Card, for more Data

Circle 153 on Inquiry Card, for more Data

In providing a secure, easily interchangeable attachment for Gravely rotary cultivators, Republic Nylok Studs are inserted into the adapter shown at left. The cultivator unit is then placed in position over studs, and nuts are applied, holding cultivator firmly in place. Republic Nylok Fasteners hold securely even under shocks from hidden stones, and vibration from the severe churning action of cultivator blades.

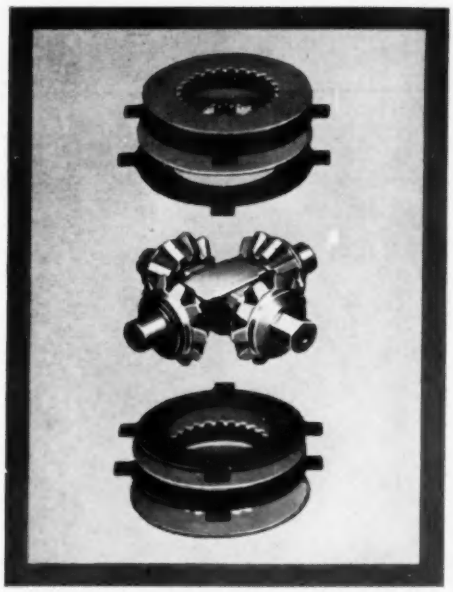
Republic Nylok® Fasteners Hold Securely Even Under Shocks of Rotary Cultivation

Finding a dependable fastening method for tractor-attached rotary cultivators presented a real challenge to Gravely Tractors, Inc., Dunbar, West Virginia. A fastener had to be found that would hold securely and give long, dependable service under the constant shocks and pounding of rotary cultivating. To meet these requirements, the company chose Republic Nylok Studs.

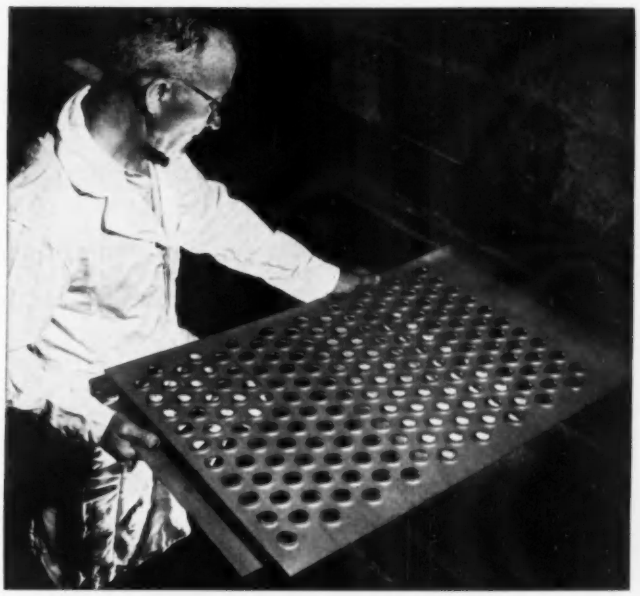
Republic Nylok Fasteners have a special nylon insert that assures positive locking at any position, even under severe shock, vibration, or tension. When the fastener is assembled, this nylon plug exerts pressure in a lateral direction, preventing all play, and utilizing the metal-to-metal contact of the opposing threads for locking.

Republic Nylok Fasteners provide maximum holding power under all conditions, whether seated or not; and they can be used repeatedly. One of their unique advantages is the "plastic memory" of the nylon plug—the tendency of the nylon to recover its original shape after assembly. This "growth" into the threads actually results in a tighter locking action, after a period of time, than when the fastener was first assembled.

The nylon insert is unaffected by age or cold, has high resistance to heat, and very low moisture-absorption rate. These are but a few of the advantages which led Gravely Tractors, Inc., to use Republic Nylok Fasteners on their advanced line of rotary cultivators. These and other advantages can pay dividends in *your* application, too. For full information, contact your Republic representative, or mail coupon.

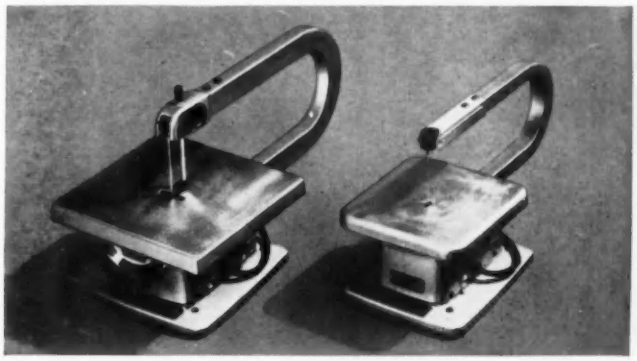


SUPER TOUGHNESS AND STRENGTH at critical points are provided by Republic Alloy Steels in the Powr-Lok Differential developed by Dana Corporation, Toledo, Ohio. Dana engineers have reduced the possibility of mechanical breakdown in clutch rings and side gears by forging these parts from Republic Hot Rolled 8615 Alloy Bars. This fine steel withstands torque, fatigue, shock, and stress, and makes possible maximum resistance to abrasion, friction, and wear. An exceptionally high strength-to-weight ratio permits the designing of thinner sections. For further facts, send coupon.



ECONOMY WITH CORROSION-RESISTANCE is provided by Republic Galvannealed Sheets, used by Air Conditioning and Drying Division, Surface Combustion Corporation, Toledo, Ohio, in making KATHABAR® Dehumidification Systems. In these units Galvannealed Sheets help solve corrosion problems. And their tight, uniform zinc coating will take all ordinary forming operations. Shear, blank, pierce, form, flange, solder, deep draw, or bead them with ease. For more information on Republic Galvannealed Sheets, mail coupon now.

SAVINGS IN TIME AND MATERIALS are realized by Syncro Corporation, Oxford, Michigan, by using Republic ELECTRUNITE® Mechanical Tubing in the manufacture of jigsaws. Previously they used a casting for the blade-yoke, which requires a severe bend. ELECTRUNITE Square Tubing was recommended for one model, rectangular tubing for the other. Results: reduction in weight of the blade-yoke, and improvement in appearance of the product, with savings in time, materials, assembly, and shipping costs. For more information on Republic ELECTRUNITE Mechanical Tubing, mail coupon below.



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- ☐ Republic Alloy Steels
- ☐ ELECTRUNITE Mechanical Tubing

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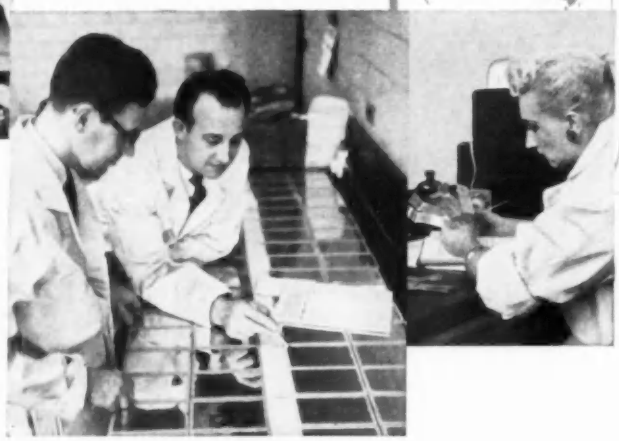

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This counterbalance of testing methods furnishes a wealth of authentic data to guide industry toward better products for better service.

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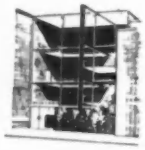
A CHILTON  PUBLICATION

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FREE LITERATURE

Self-Lub Bearings 1

Self-lubricating Iron Oilite 212 bearings are described in a 4-way folder prepared by *Amplex Div., Chrysler Corp.* These bearings are suitable for many applications where corrosion is not a problem and mechanical strength is within tolerable limits.

Panel Instruments 2

Bulletin GEA-6788, 15 pages, includes descriptions, construction and operation details, dimension and connection drawings and specifications and ratings for aircraft quantity-electric measurement systems. *General Electric Co.*

Welding Wires 3

Bulletin DH-402-C, six pages, gives information on Page submerged arc and inert gas welding wires. Featured is a description of the uses of 26 different analyses of stainless steel, low alloy, and mild carbon steel automatic welding wires. *Page Steel and Wire Div., American Chain & Cable Co., Inc.*

Automatic Assembly 4

Bulletin 601 justifies automatic assembly when economic feasibility is doubtful due to low production rates. Methods of tooling machines with slow cyclic rates and the design of equipment which can produce different, but basically similar, items are featured. *Ferguson Machine Corp.*

Angle Attachments 5

A line of angle attachments for power hand tools which permits "around the corner" precision drilling, burring, rotary filing, grinding, polishing, high speed nut setting and screw driving at 45 degrees, 90 degrees, or inverted 45 degree angles, is described in a catalog released by *Drexler Div., Monument Engineering Co., Inc.*

Servo Motors 6

Catalog 5000, 20 pages lists and fully describes all basic models of Oster's complete line of precision made servo motors, sizes 8 to 29, for scientific, military and industrial applications. *John Oster Mfg. Co., Avionic Div.*

(Please turn page)

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FREE LITERATURE—*Continued*

Clutch-Pulley Package 7

Warner Electric Brake & Clutch Co. is offering a 10 page brochure which describes in detail Warner's clutch-pulley package for direct installation on standard electric motors from 1 to 25 hp. Included are sections on operation, dimensions, and selection.

Power Plants 8

Design, construction and mechanical features of two power plants—the 2100° and 1600° Diesel engines—are described in a 16-page catalog prepared by *Allis-Chalmers Mfg. Co.* The catalog, BU-540, is complete with many illustrations, including charts, graphs, and cutaway views of the engines.

Film Finishes 9

A system for producing corrosion resistant, organic film finishes on fasteners and small parts is reported and described in a technical bulletin offered by *International Rustproof Corp.*

Metal Cutting Units 10

Michigan Special Machine Co. has completed and released their catalog outlining services for automation equipment, components, standard and special machines for metalworking industries. Pictures and drawings of various models of equipment are shown along with pictures and drawings of parts produced.

Speed Drive Equipment 11

Bulletin GB-3 is a comprehensive illustrated bulletin describing a line adjustable speed drives for industrial applications. It discusses eddy-current couplings, drives, brakes and dynamometers, as well as magnetic friction clutches and brakes. *Dynamic Div., Eaton Mfg. Co.*

Shipping Containers 12

A 12 page illustrated brochure contains large illustrations of various types of metal shipping containers and explains their application in the field of aircraft, missiles and rockets. *DeVilbiss Metal Fabricators Co.*

Static Metallic Seals 13

A line of static metallic seals, for use in hydraulic and pneumatic systems, combining infinite shelf life with effective sealing throughout a temperature range of —350 to 1800 F and under pressures up to 20,000 psi, is described in engineering bulletin 104. *Cadillac Gage Co.*

Cutting-Off Machine 14

Bulletin 2312, two pages, describes the Aminco cutting-off machine, a machine that cuts virtually all hard materials in a minimum amount of time. Such materials include hardened steel, other metals, glass, plastics, stellite, ceramics, etc. *American Instrument Co., Inc.*

Heat Treating 15

A 48 page technical bulletin describes the luminous wall combustion system for gas-fired, infrared heat treating furnaces. Titled "Instantaneous Heat," it shows what the luminous wall development is, how it works, its present and future applications, etc. *The A. F. Holden Co.*

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FREE LITERATURE— *continued*

Carbon Steel 16

Peter A. Frasse & Co., Inc. has announced the availability of a new chart, Sec. E, No. 1, with which carbon steel government specifications can be easily identified. The chart shows chemical analysis requirements for 60 most frequently used military and federal specifications.

Wheel Dressers 17

An eight page folder issued by the *J & S Tool Co.* describes their complete line of fluid motion wheel dressers that dress two angles tangent to a radius in one continuous motion with 0.0001 in. accuracy.

Grinding Gages 18

Catalog 59A, 16 pages, covers the complete line of Arnold continuous grinding gages. The three items are a miniature OD grinding gage, a king-size OD gage, and a gage for continuously measuring inside diameters while grinding. *Federal Products Corp.*

Storage Bins, Pans 19

Bins and pans designed for the convenient storage and handling of all barrel finishing media are described in bulletin 401, two pages. *Techline Div. of Wheelabrator Co.*

Accessory Equipment 20

Lyndon Aircraft, Inc., has completed a 26-page catalog which describes and illustrates accessory equipment designed and built for use in aircraft, missile and space craft.

Aluminum Finishing 21

In the CLEPO aluminum finishing manual, the reader will find a detailed discussion of many different problems concerning the finishing of aluminum, as well as methods and materials for taking care of these problems. *The Frederick Gumm Chemical Co.*

(Please turn page)

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Honing Machine 22

Bulletin X-MAN-5000-1 describes Sunnen honing machines and their applications in production, maintenance and tool room work. Equipment working range covers hole diameters from one inch through 2.625 in. with tooling available from stock: and to 4½ in. with custom tooling. *Sunnen Products Co.*

Test Console 23

A two page brochure, Bulletin 1382, explaining a 5000 psi hydraulic components test console for the missile industry is available from *George L. Nankervis Co.*

Screw Conveyor Drive 24

Bulletin A667C, 16 pages, describes a compact screw conveyor drive complete with speed reducer, packing gland and drive shaft, all of which mount as a unit on a trough end. *Dodge Mfg. Co.*

Press Brakes 25

Dreis & Krump Mfg. Co. has issued an eight page bulletin on Series D Chicago mechanical press brakes. Details and specifications on 40 standard sizes in this series with capacities of from 90 to 500 tons are included.

Double Crank Presses 26

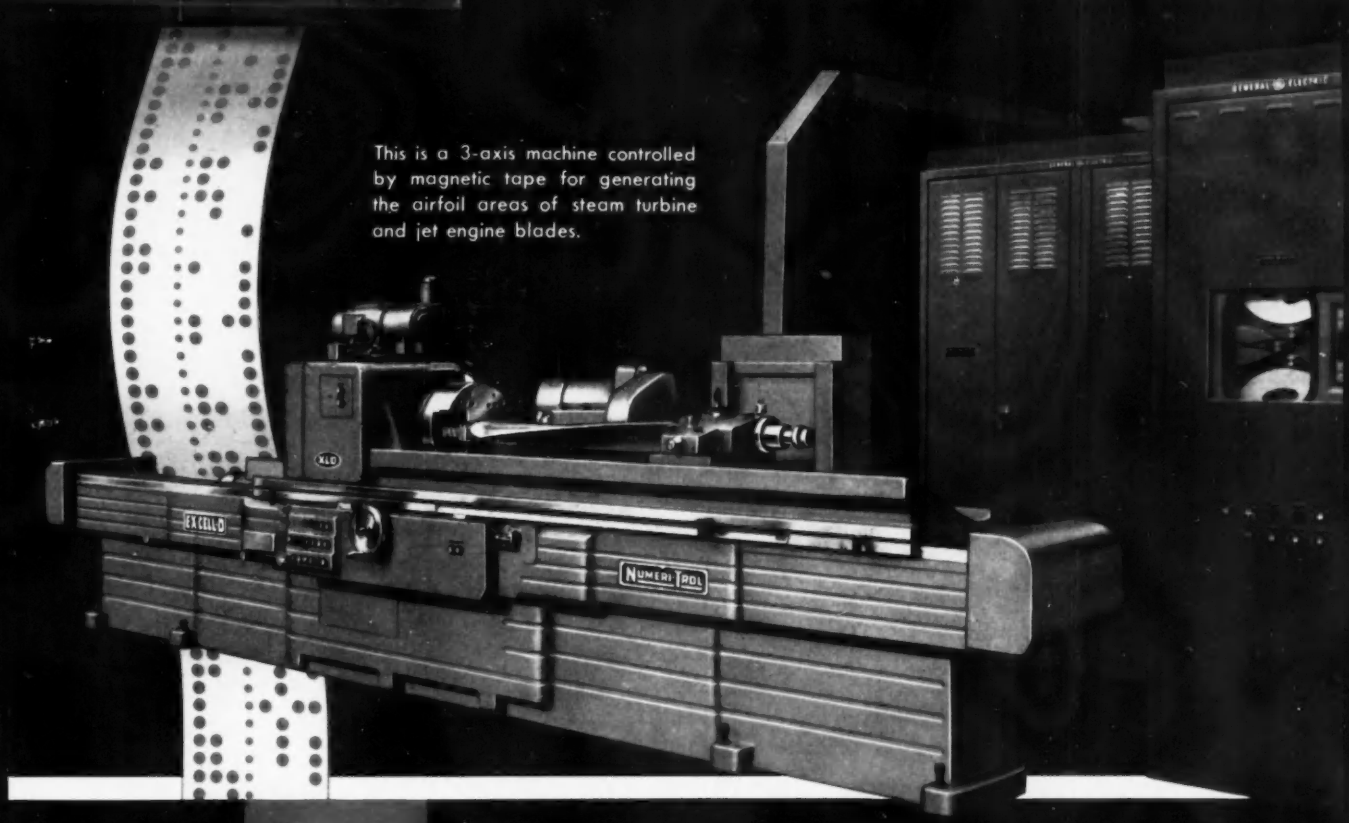
A color bulletin about the Warco line of straight side double crank presses illustrates and describes a complete line of presses in capacities from 60 to 400 tons inclusive. *The Federal Machine & Welder Co.*

Positioning Control 27

A complete system for automatic positioning of machines and machine tools is featured and described in an eight-page folder prepared by *General Electric Co.*

Processing Furnaces 28

A line of heat processing furnaces, featuring high velocity heat flow in both electric and gas-fired models, is described in a literature sheet published by Despatch Oven Co.

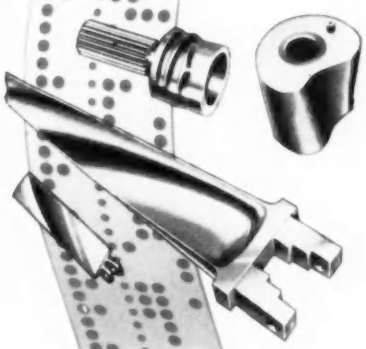

This is a 3-axis machine controlled by magnetic tape for generating the airfoil areas of steam turbine and jet engine blades.
EX-CELL-O
NUMERI-TROL

NUMERI-TROL

59-3

COMPUTER INPUT TAPE USED IN PREPARATION OF MACHINE CONTROL TAPE

TAPE CONTROLLED PRECISION PROFILING MACHINES BY EX-CELL-O



FIRST to provide 360° work rotation for 3-dimensional machining of complex parts

FIRST to combine grinding, dressing and dressing compensation with milling

Numeri-Trol puts a new dimension into machining. Lead time goes down, tooling costs and machining time are cut in production of prototypes and complicated precision parts. Lateral movement of the work head and transverse travel of the cross slide combine with rotary work feed to permit milling and finish grinding impossible or uneconomical by ordinary standards. Wheel dressing and dressing compensation are fully tape-controlled. Numeri-Trol machining includes rotary and longitudinal milling with automatic work feed and 360° indexing.

Have a part that is costing too much to make? Find out how Numeri-Trol can produce it—economically! See your Ex-Cell-O Representative or write direct.

XLO EX-CELL-O FOR PRECISION

EX-CELL-O CORPORATION Machinery Division
DETROIT 32, MICHIGAN

EX-CELL-O PRECISION PRODUCTS INCLUDE: MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • THREAD AND GROOVE GAGES • GRANITE SURFACE PLATES • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

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CASE HISTORIES

N/D precision ball bearing end play surpasses needs of linear actuator application. Moreover, bearing is lubricated for extended service against severe climatic condition.

Actuator Photo: Courtesy Armament Division, Universal Match Corp., St. Louis, Mo.

Production Ball Bearings Give Low Cost Answer To B-52 Actuator Problem!

CUSTOMER PROBLEM:

Manufacturer experienced rejects in B-52 aileron trim tab actuator inspections because over-all linear motion could not be held to specified limits.

SOLUTION:

To hold linear actuator end play to proper tolerance, the thrust-supporting ball bearing end play had to be held to a maximum .003". N/D Sales Engineer, working with the manufacturer, recommended New Departure *low cost* single row production ball bearings with standard N/D close internal tolerances. Extensive testing proved that these N/D *production* ball bearings surpassed specifications, assuring end play .001" less than allowed limits. Most important, these high precision N/D ball bearings supplied definite cost advantages over the previous bearings used which required costly hand selection. All this, thanks to New Departure's advanced inspection techniques.

If you're experiencing a bearing problem, or questionable costs in production, why not call on New Departure? There's probably an N/D *production* ball bearing that will meet your specifications, or exceed them . . . and possibly at an over-all cost reduction! For more information write Department C-5.

NEW DEPARTURE

DIVISION OF GENERAL MOTORS, BRISTOL, CONN.

NOTHING ROLLS LIKE A BALL

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